MARK ROBERTS MOTION CONTROL

STUDIOBOT TX90

QUICK START GUIDE

QSG Product Code: MRMC-2267-00
Products Covered: MRMC-2000-00-JB-0053, MRMC-2000-00-JB-0054

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Studiobot TX90 Quick Start Guide

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Overview

Thank you for using the Studiobot TX90 from Mark Roberts Motion Control (MRMC). Studiobot TX90 is designed for reliable day-in, day-out use in professional studio and Outside Broadcast environments. It has a small, lightweight robotic arm which can be used either as camera rig or model mover. There are two versions of Studiobot TX90:

Studiobot TX90 on Track has a base designed for moving along Precision Track, which can be bolted to the ground and can also be held down with weights at temporary locations. It has removable trolley wheels for moving between sets.

Studiobot TX90 on Pedestal has a stationary base which you either hold down with weights or, for more permanent installations, attach to the floor.

Safety procedures for using industrial robots, including high speed track

Note that the words **Robot** and **Rig** are completely interchangeable and identical in meaning, for the purposes of this document.

Motion Control rigs are potentially dangerous. It is important that you and everyone else on the set understand the safety notes on the following pages in order to stay safe.

You should use this document in addition to the normal Safety Manual instructions that are applicable to all motion control rigs, such as Milos. This section emphasises the safety concerns that are especially important around high-speed, high-acceleration, industrial-grade robots which can cause severe injuries, such as Studiobot TX90.

- Unlike traditional motion control equipment, Studiobot TX90 can get to maximum speed in the blink of an eye - too fast for someone to be able to quickly move out of the way.

⇔ If you are using Studiobot TX90 on Track, you need to take extra steps during installation and use due to the additional risks involved in using track. See the separate *Precision Track Quick Start Guide* for information on laying the track, securing it to the floor, and mounting Studiobot TX90 onto it. The notes given below for track users are marked with this symbol: ⇔.

- It is ultimately the **operator** of the rig who is responsible for the safe use of the equipment so never bypass any of the safety points listed here.
- No one other than a highly trained operator should use the robot, no matter how simple it looks or is.
- This document is for the use of robots for carrying cameras or props, not people. Additional safety steps should be taken prior to using a rig to carry people.

Assessing a site

Before setting up Studiobot TX90 you need to **assess the site**, paying particular attention to the following points:

- Is the ground or floor firm enough and level enough? You might have to use boards or bricks to create a level surface. The surface needs to be strong enough to take the weight of Studiobot TX90 itself (294 kg) plus the weight of the track (95 kg per section).
- Does the site have access? You need to make sure you can either push Studiobot TX90 into position on its wheels or carry it there using a pallet truck or forklift.
- Does the site have a power source with sufficient capacity for the robot and the correct mains voltage?
  - Studiobot TX90 on Track requires a **240 Volts, single-phase power supply via 2x16amps power connectors**.
  - Studiobot TX90 on Pedestal requires a **240 Volts, single-phase power supply via a 16amps power connector**.
  - The computer stack that controls Studiobot TX90 are auto-switching and can run on 120-240 Volts AC.
- Does the site have unusual environmental attributes that require specialised protection from extreme temperatures, humidity, rain, or dust?

Installation safety

- Due to the large mass of the rigs and the accelerations they achieve it is important that they are securely mounted, with the recommended plates and bolts to a secure and concrete floor.

⇔ When using track, ensure that it is properly bolted to the floor. If bolting the track is not possible, use 100kg of counter weights on each corner of the track.

⇔ Make sure there is plenty of clearance around the length of the track for the trailing cables of the rig to slide along the floor. Ensure that they are not mounted in such a way so that they

can catch on the track or robot as it moves along the full length.

- Ensure the floor can support the load and the stresses (see above).
- Ensure the power supply is properly earthed (grounded) and of the correct voltage (see above).
- If the rig is mounted to something other than the floor then the mount should be heavy and strong enough to take the forces and not move or fall over during sudden starts and stops. Use the recommended minimum thickness steel plates. Check with MRMC if you are unsure of the exact requirements for your robot.
- Check that all cables are securely fixed and are not going to catch during motion.
- Ensure the camera, lens, focus motor, accessories, power supplies/batteries, etc. are all very securely mounted and will not come off during sudden motions, to become lethal missiles.
- Ensure all safety accessories are securely attached and in working order, including emergency stops, safety sensors, etc.
- Clearly mark the area around the robot in which no persons are allowed to enter. As a bare minimum, use brightly marked tape on the floor, outside the reach of the robot, to indicate the "No Go Zone". Ideally, use physical safety barriers, and light guards/curtains.
- Keep stands, lights and accessories out of the No Go Zone, if possible. If not possible then try to take as much care with their positioning and the motion of the rig, as if they were a person. Remember a light, accidentally hit at high speed by the robot, can be just as dangerous to someone standing outside the No Go Zone as the robot is to someone standing in the zone.
- Someone standing outside the No Go Zone as the robot is to someone standing in the zone.
- Where physical safety barriers are impractical, light guards should be used or similar alternatives such as laser scanners, to stop anyone entering the No Go Zone during motion.

- Ideally have the robot surrounded on all four sides by a safety barrier, but where that is not practical, ensure that the maximum number of sides feasible are closed off, and that any person having to stand within reach of the robot is located as far away as possible for the shot.

⇔ Never let anyone cross the robot's track when the track motor is powered up. In fact, it is a good idea to get into the routine of walking around the track instead of over it so that you don't cross the track out of habit when the track motor is powered up.

Software setup

- Always ensure you have the right configuration for the robot you are using, such as maximum axis speeds and accelerations.
- Prior to running moves, enter in and keep to a minimum all software axis and Cartesian limits. For example if the main axis only needs to travel +/-40 degrees then reduce the limit to +/-40 degrees even though it could do +/-180 degrees. This keeps the likelihood of operator or software errors to a minimum.
- Also check the Cartesian speed and acceleration limits are set to reasonable values.

Operational safety

- Do not use around flammable gas. All electrical equipment can generate sparks that can ignite flammable gas.
- Keep the equipment dry. The system has **not** been made weatherproof. Do not use with wet hands.
- Always run moves only when standing within easy reach of the emergency stop.
- Always tell the production company and the crew to keep away from the robot and not approach it when any of its red lights are on which indicates it is powered up. Have them sign the appropriate safety documents and disclaimers to ensure they understand this and are indemnifying MRMC if anything happens.

- Always loudly and clearly indicate to others when the rig is about to move. Shout “Rig Moving!” if no other means exists.

⇔ When using track motion always have someone keep an eye on the trailing rig cables to ensure they don’t get caught on anything or anyone.

- Always ensure the rig is disabled when someone has to enter the No Go Zone.

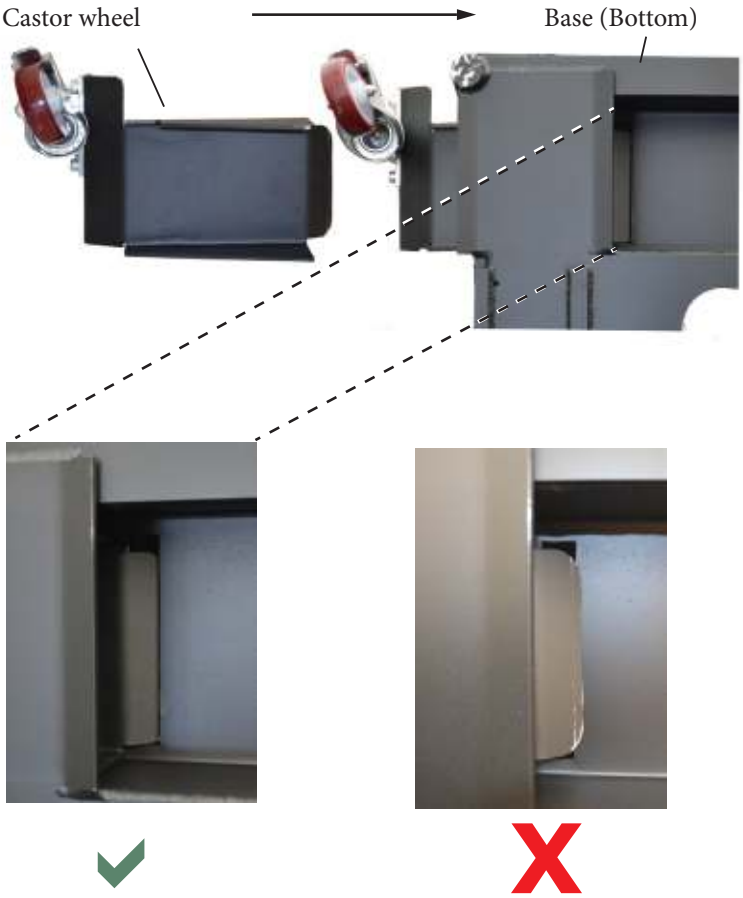
- Always run any move or adjusted move slowly at first to check the motion. Even if you have checked the move previously, if you make a minor change to it then you need to recheck it.
- Keep the software in “slow mode” unless the move has been tested and is now specifically doing a high speed pass.
- In the event that a person or Actor has to be within the no-go zone during a move (hand model etc.) ensure that they are fully briefed on the safety requirements and that they know not to change their position or do anything other than the rehearsed moves without fully warning the operator. Any such person is to have a clear escape route to allow them to move safely away from the robot.
- During use, repeatedly check the rig mounting points, cables, camera mount, accessories etc. to ensure nothing has, or is, working its way loose.
- Never bypass any safety hardware or software.

Mounting the Castor Wheels (Studiobot TX90 On Pedestal)

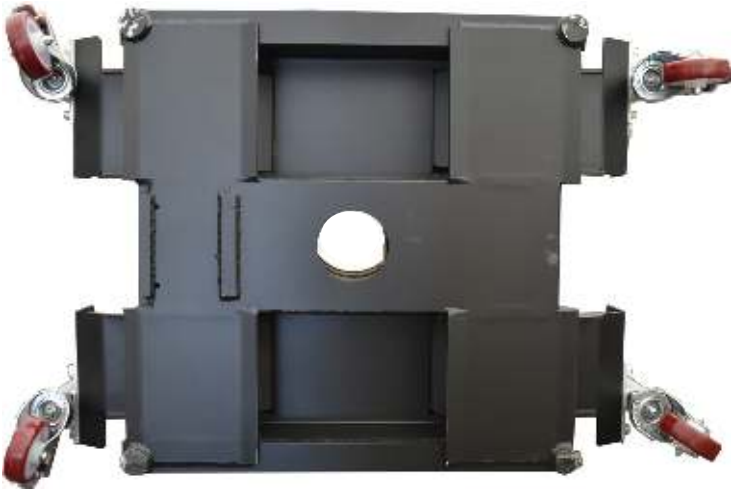
If the castor wheels are not mounted, use the following procedure to mount the castor wheels:

1. Gently tip the base over from the top so its bottom is visible.

2. Slide one castor wheel into the base ensuring that edge of the plate in the wheel assembly is inserted in the slot in the base.



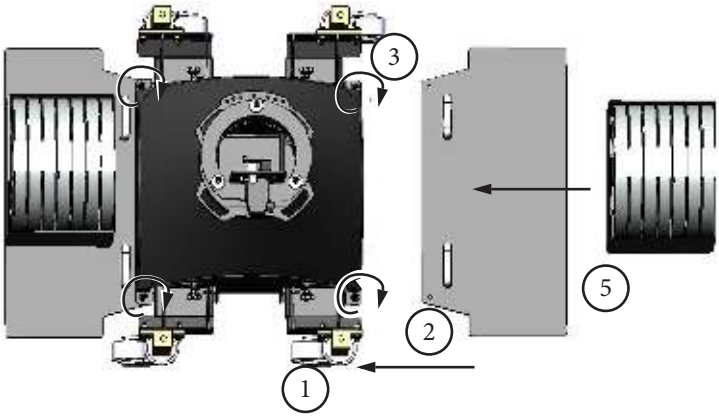
3. Similarly insert all the castors into the base ensuring the plates are inserted into the slots.



4. Stand the base on the wheels and tighten the four screws to secure the castor wheels on the base. Do not use the jack screws on the wheels yet to seat them on the ground.

Mounting the Weight Plates (Studiobot TX90 on Pedestal)

1. Use the jack screws on the castor wheels to lift the base high enough to insert each of the weight plates on either side of the Studiobot TX90 Base lining up the screw cavities.
2. Lower the base close to the wing but not quite resting on it, close enough for the two retaining bolts to reach the wings through the base.
3. Secure the weight plates using the 2xM10 screws on either plate.
4. Lower the base completely so it is resting on both wings. At this point, you can remove the castor wheels, if so desired.
5. Put the weights onto the wings. Studiobot TX90 requires four boxes of weights — one at each corner. Each box contains 140kg of weights (7 × 20kg).



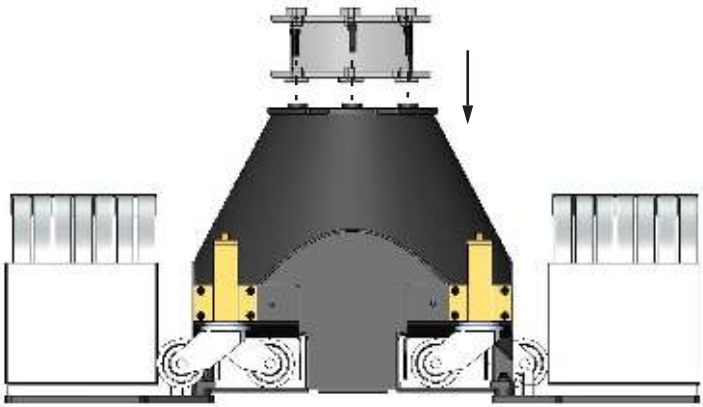
Hint

You can move Studiobot TX90 without removing the wings if you want, as long as you take the weights off first.

Mounting the Riser

Use the following instructions to mount any riser or an additional riser on the pedestal:

1. Lower the riser on the base aligning the three screw cavities.
2. Tighten the three screws.



Note

If you are using the 300mm riser, anchor the Studiobot TX90 on Pedestal down to the floor. Refer to the next section for details.

Limitations when using weights

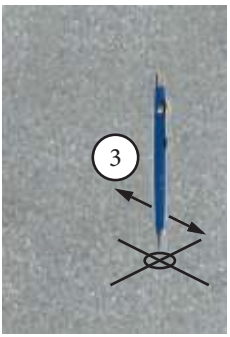
If you are using weights, reduce the top-speed by 50% when you have the 300mm riser added. With the small riser (150mm), reduce the speed by 25%. If you are using both the risers together, then the rig can only be used at slow speeds.

Anchoring Studiobot TX90 on Pedestal to the floor

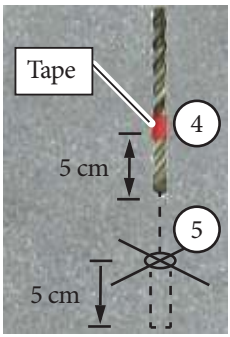
If you are setting up Studiobot TX90 on Pedestal in a permanent (or semi-permanent) location, you can anchor the pedestal to the floor as an

alternative to holding it down with weights. The following procedure tells you how to anchor the pedestal to a concrete floor.

× 4 corners



× 4 corners



× 4 corners

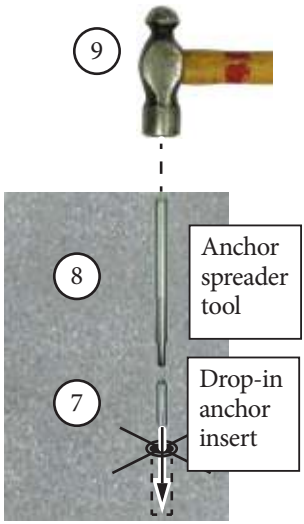
1. Temporarily put the Studiobot TX90 on Pedestal into place where you want.
2. At one corner of the pedestal, use one of the two holes to draw a circle on the concrete with a pencil, to mark the position of the hole. You can use either hole.

   Repeat for the other three corners of the pedestal.
3. Temporarily remove Studiobot TX90 on Pedestal and at one of the four circles that you have drawn, draw a cross centred on the circle, to help you precisely locate the drill bit.

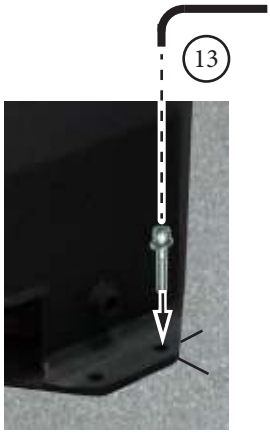
   Repeat for the other three corners.
4. On the 15mm diameter drill bit, put tape around the bit 5 cm from the tip. This will help you gauge the depth of the hole in the next step.
5. At one of the corner circles, drill a hole 5 cm deep into the concrete, centred on the cross. When the tape on the drill bit reaches the floor, drilling is complete.

   Repeat for the other three corners.
6. Clean the four holes.

7. At one of the holes insert the drop-in anchor insert, threads upward, all the way to the bottom.
8. Insert the anchor spreader tool into the drop-in anchor insert.
9. Hit the top of the anchor spreader tool with a hammer until the anchor is fully spread in the concrete.
10. Remove the anchor spreader tool.
11. Repeat steps 7 to 10 for the other three corners.
12. Put Studiobot TX90 on Pedestal in place over the holes.
13. Insert the four retaining bolts through the corners of the base and into the drop-in anchor inserts, and tighten.

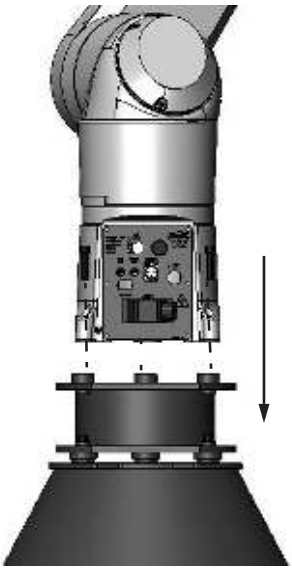


× 4 corners



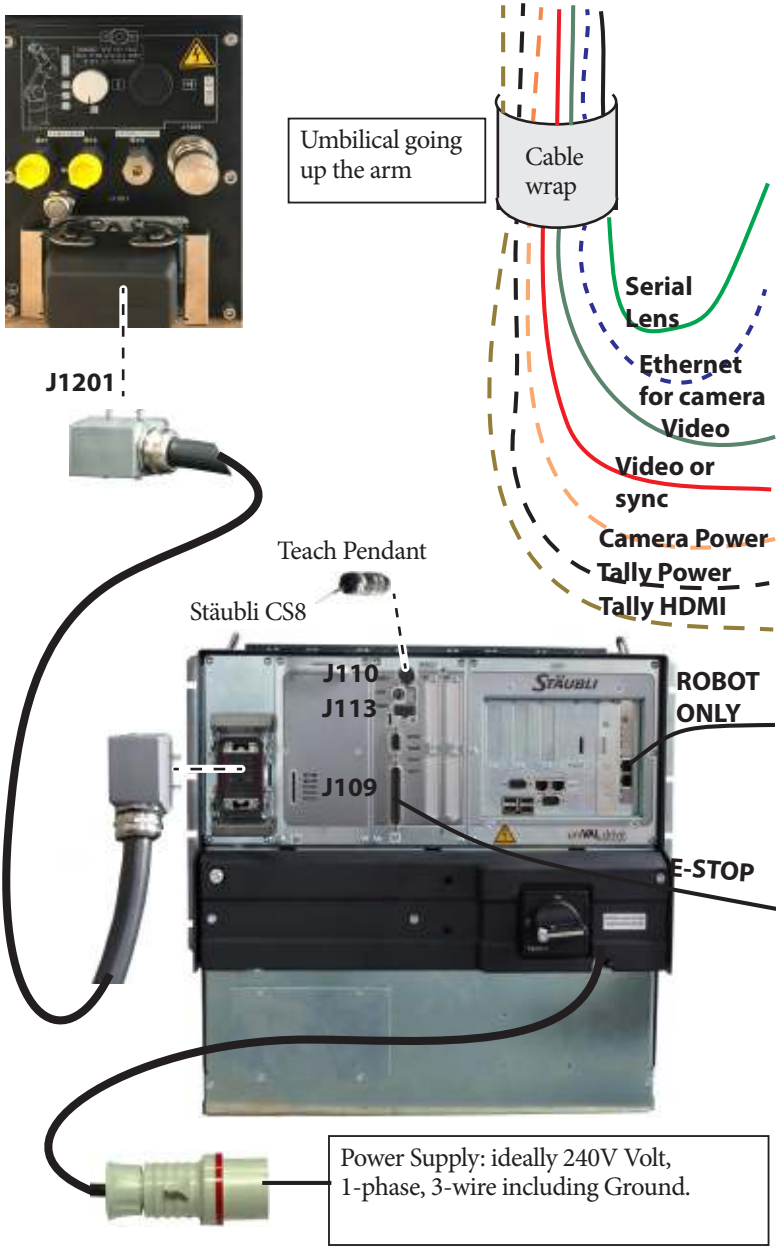
Mounting the Staubli Arm

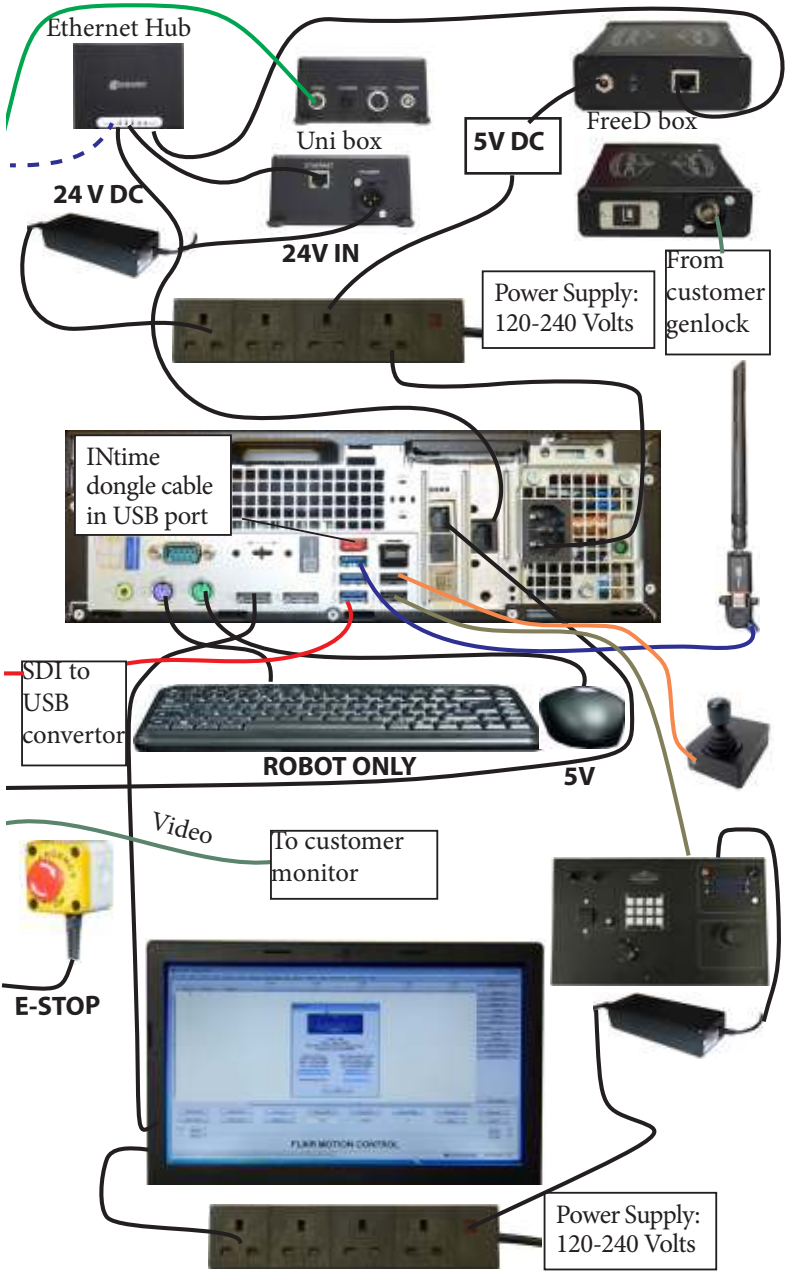
1. Lower the TX90 Staubli arm on the Studiobot TX90 on Pedestal aligning the sides and screw cavities.
2. Tighten the three screws.



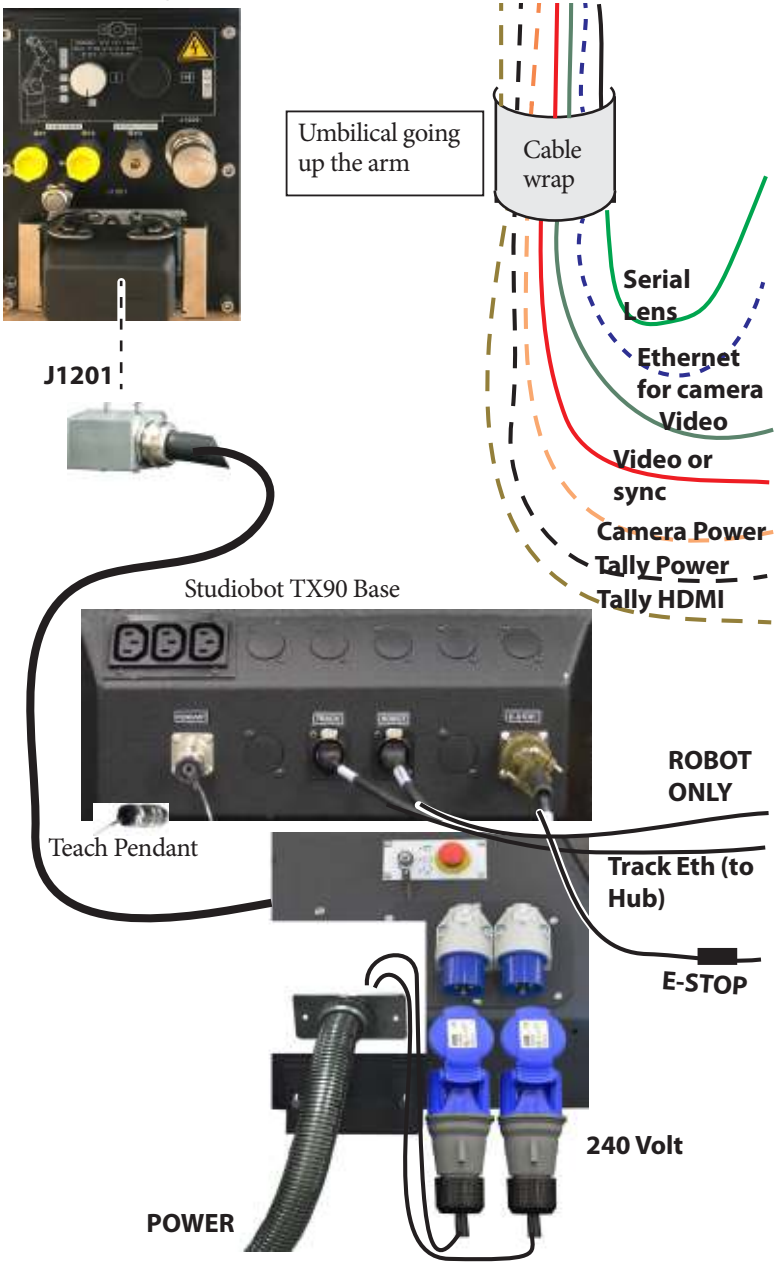
Notes

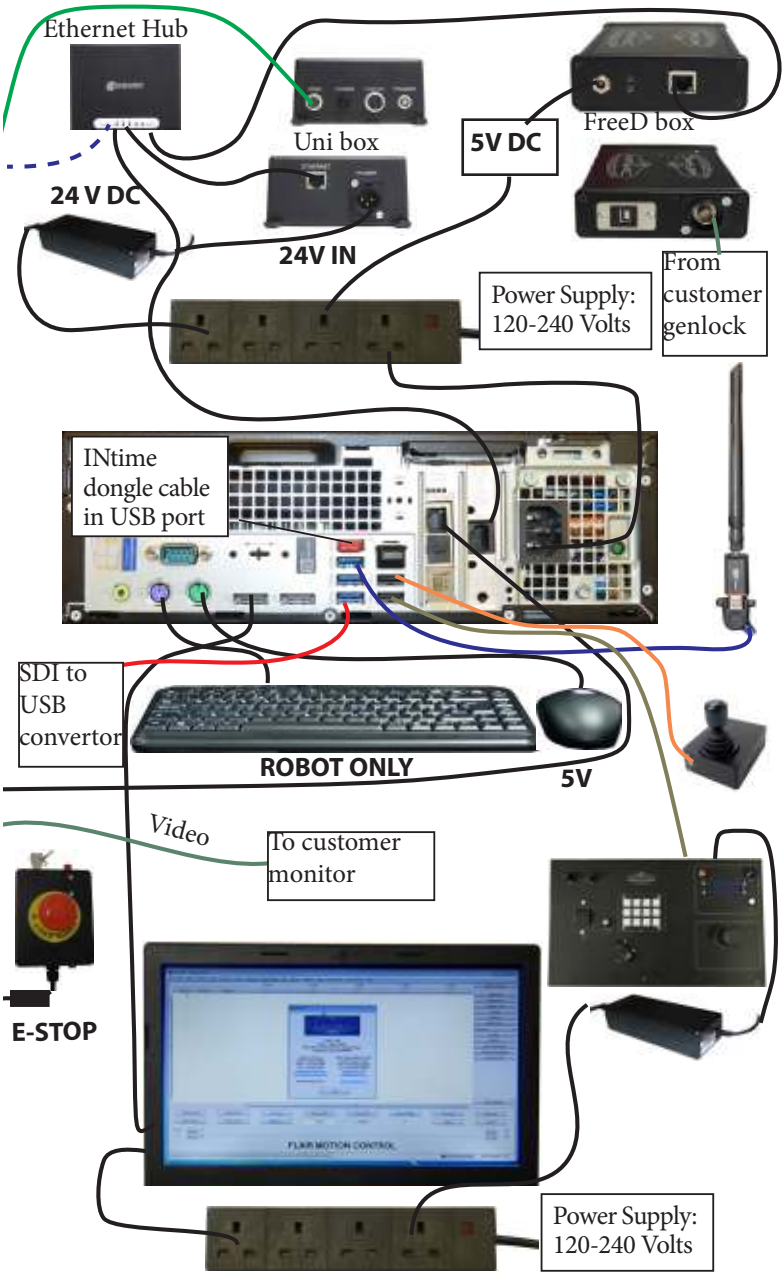
Connecting the cables — Studiobot On Pedestal




Ethernet Hub
Uni box
5V DC
FreeD box
24 V DC
24V IN
From customer genlock
Power Supply: 120-240 Volts
INtime dongle cable in USB port
SDI to USB convertor
ROBOT ONLY
5V
Video
To customer monitor
E-STOP
Power Supply: 120-240 Volts

Connecting the cables — Studiobot On Track




Ethernet Hub
Uni box
5V DC
FreeD box
24 V DC
24V IN
From customer genlock
Power Supply: 120-240 Volts
INtime dongle cable in USB port
SDI to USB convertor
ROBOT ONLY
5V
Video
To customer monitor
E-STOP
Power Supply: 120-240 Volts

Starting up the Studiobot TX90 system

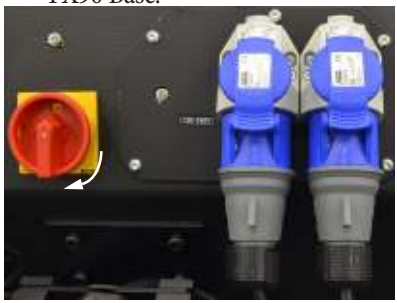
Once you have attached all the cables, you power up the rig by switching on the components in the order described below.

1. Make sure you have secured the area around Studiobot TX90. Put up guard rails around Studiobot TX90 (and the track) as necessary, and tell others on the set that you are now powering up the rig.

2. Release the E-stop on the **Studiobot TX90 Base** by turning the red button clockwise until the button pops up. Also make sure the key is in the clockwise position. **Do not release the other E-stop by the computer stack yet.**

3. Power up Studiobot TX90 itself as follows:

   Turn on the power switch on the side of the Studiobot TX90 Base.



   For StudiobotTX90 On Pedestal, turn on the power switch on the Stäubli CS8.

The Studiobot TX90 power-up sequence takes about three minutes.

Hint

The Stäubli CS8 is housed inside the Studiobot TX90 Base, which you will not need to access under normal circumstances. However, in case of a fault, you can access CS8 by unscrewing the bolts on the plate covering the CS8 in Studiobot TX90 Base.

Studiobot TX90 Base plate covering CS8

When the power-up sequence has completed, the Stäubli CS8 shows an "**A**" on its display.

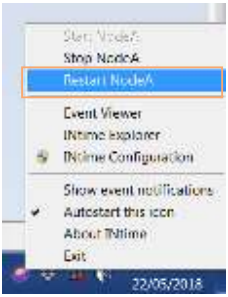
4. Power up the Flair computer system and all of its components. You can do this while the robot is powering up (step 3). **Do not start the Flair application yet**.

5. After the robot has finished powering up (step 3), the cifX board in the Flair PC display two steady lights and one blinking light (see previous diagram).

   If the cifX board lights do not show as above after about three minutes, then close Flair and restart INtime as follows:

5.1 In the Windows Taskbar, right-click the INtime icon.

5.2 Select **Restart NodeA**.



6. On the Flair PC, start the Flair application by double-clicking on the Flair icon on the Desktop.

   Flair automatically loads the relevant firmware into all attached axis boards, including any additional interface boxes that are attached to the computer stack

7. Release the E-stop that is plugged into the computer stack, by turning the button clockwise until the red button pops up and then pressing the Reset button.

   Once all E-stop buttons on the system are up, the Stäubli CS8 display shows "**U**".

8. Zero the axes as required in Flair. The robot arm itself does not require zeroing but you need to zero other axes such as:

   - The track: To do this you use the **Zero > Home Axis > Track** menu option.
   - Any external Lens Control Motors (LCMs) that you are using. To zero these you first set the **focus to infinity** (∞), **zoom to wide-angle** (zoomed out all the way), **iris/aperture to wide open** and then use the relevant **Zero > Direct Zero Axis** menu option to set those lens positions as the zero points in Flair.

9. In Flair, click on the **Engage Robot** button.

> Hint
>
> You use the **Track** button in Flair to toggle the track on and off, independently of the **Engage Robot/Disengage Robot** button that you use to toggle the Studiobot TX90 arm on and off.

10. In Flair, move the Studiobot TX90 arm to its home position (rotated straight forward and tucked under).

> Hint
>
> If the Studiobot TX90 arm is in a backward or reversed starting position, the arm might swing overhead or around the side to reach the home position, possibly striking the walls, ceiling, or other rigging! If the rig is in an enclosed space or near other equipment, it is recommended that you do the following:
>
> 
>
> - Manually move the arm close to its home position before Homing it.
> - When you home the rig, have one hand ready on the E-stop in case you need to stop the rig quickly.

11. Set the soft limits for the rig axes in Flair as required:
    - Arm position limits
    - Track limits
    - Lens Control Motor limits (if using external LCMs)

Studiobot TX90 start-up summary

1. Secure the area
2. Release the E-stop on the rig
3. Switch on Studiobot TX90
4. Switch on the Flair PC
5. Check networking lights after three minutes; **Start Robot** if needed
6. Start Flair
7. Release the E-stop on the computer stack

In Flair:

8. Zero the track and Lens Control Motor axes
9. **Engage Robot**
10. Home the arm, carefully
11. Set the soft limits

The rig is now ready to use.

Shutting down the Studiobot TX90 system

1. Move Studiobot TX90 to its Home position, for both the arm and the track.

   or...

   If you are going to transport Studiobot TX90 to a new location, put the Studiobot TX90 arm into its transport position. You can do this either by using Flair (although you might have to reset the soft limits to reach the transport position) or by moving the arm manually. For details see page 47.

2. In the Flair software, click on the **Disengage Robot** button.
3. In the Flair software, disengage the track by toggling off the **Track** button.
4. Press down all E-stop buttons:
   - On the computer stack
   - On the **Studiobot TX90 Base**
5. Close the Flair software.
6. Shut down Windows on the Flair PC.
7. Turn off Studiobot TX90 as follows:

For Studiobot TX90 On Pedestal, turn off the power switch on the Stäubli CS8.

Turn off the power switch on the side of the Studiobot TX90 Base.

To remove Studiobot TX90 from the track see *Mounting Bolt (family of robots) on the track* in the separate *Precision Track Quick Start Guide* and follow the instructions there in reverse order, to attach the trolley wheels, detach the pinch motor wheels and remove the rig from the track bearings.

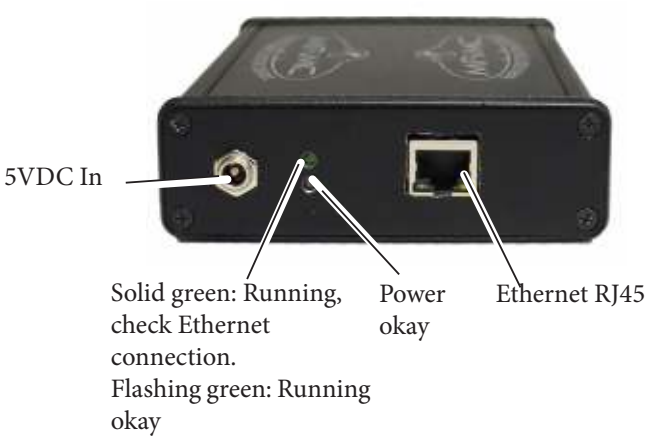
Studiobot TX90 shut-down summary

1. Move Studiobot TX90 to the Home or Transport position
2. In Flair: **Disengage Robot**
3. In Flair: Toggle off the **Track**
4. Press down all E-stops
5. Close Flair
6. Shut down Windows
7. Switch off Studiobot TX90

FreeD Sync Box: Setup and configuration

FreeD sync box needs to be configured before first use (normally configured at the factory).

1. Connect the FreeD box via Ethernet to the same network as that of the Flair PC of the Studiobot TX90 rig.

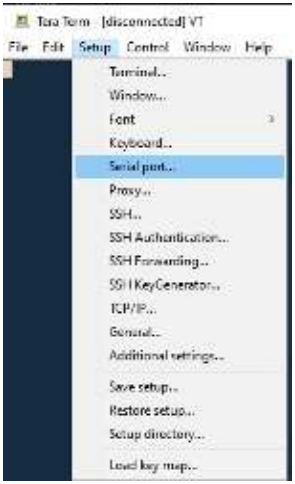


2. Power up the FreeD box by supply 5VDC IN.

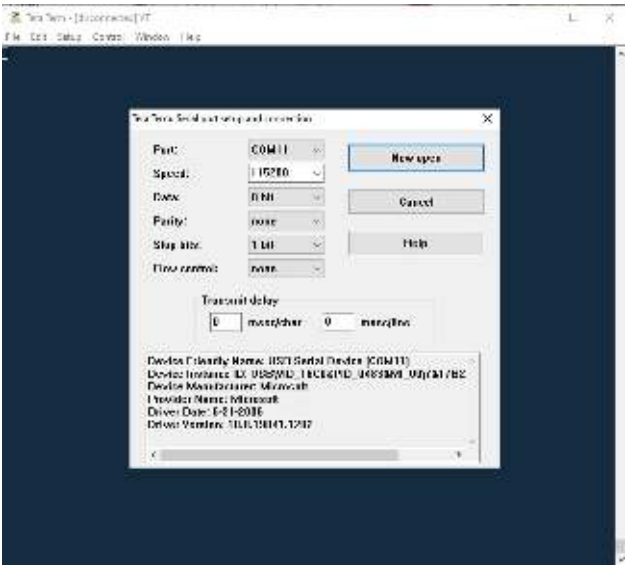
3. Install TeraTerm and set it up (free application).

   You can download it here: https://ttssh2.osdn.jp/index.html.en

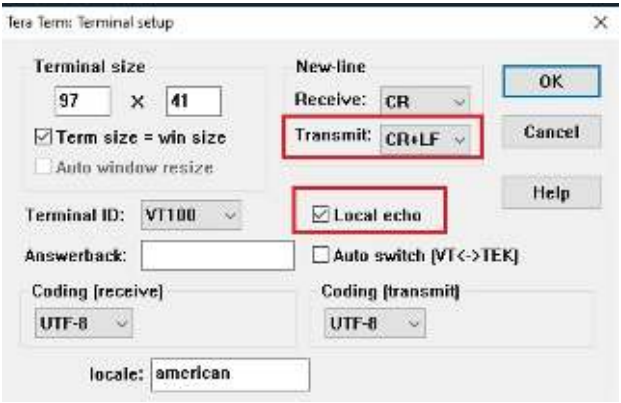
4. Launch TeraTerm and select **Setup > Serial** port.



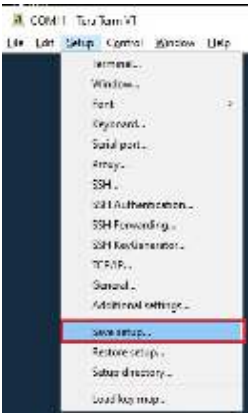
5. The Serial Port Setup and Connection dialog box will show the following information. Click Cancel to close the dialog box.



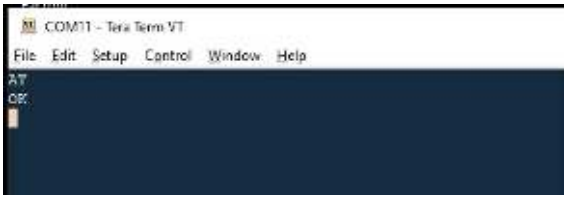
6. Select **Setup > Terminal.** In the Terminal Setup dialog box, select the following options and click OK.



7. Select **Setup > Save Setup** to save the setup.

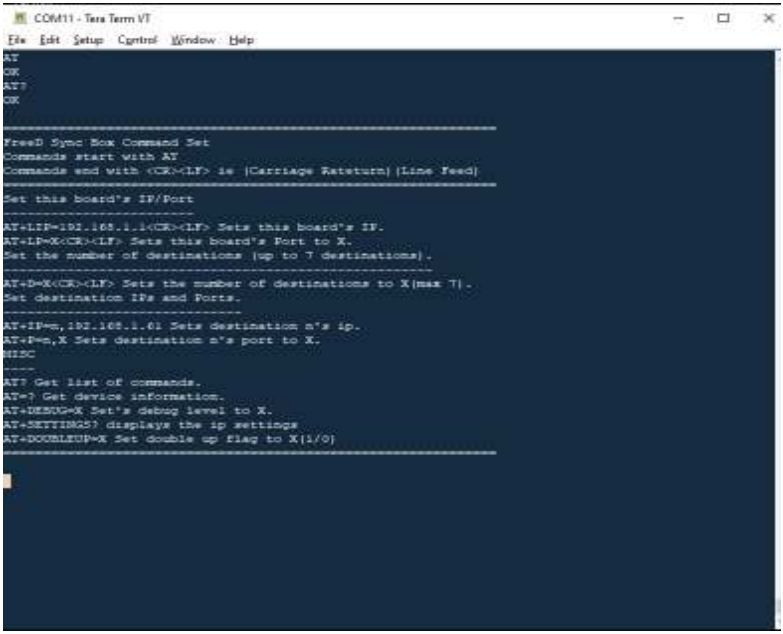


8. Type "**AT**" and press Enter. AT(Attention). If you get an '**OK**' message as response, your setup was successful.

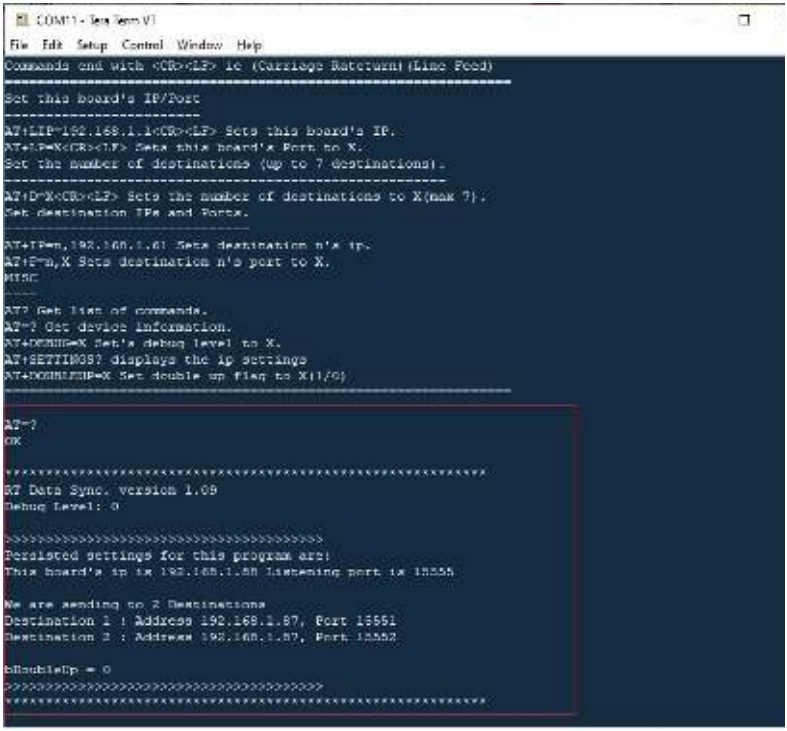


If you don't get any response, check your physical connection (USB, Genlock, Ethernet and 5V should all be connected).

9. Type "**AT?**" to get a menu of commands.



10. **AT=?** will respond with system information.

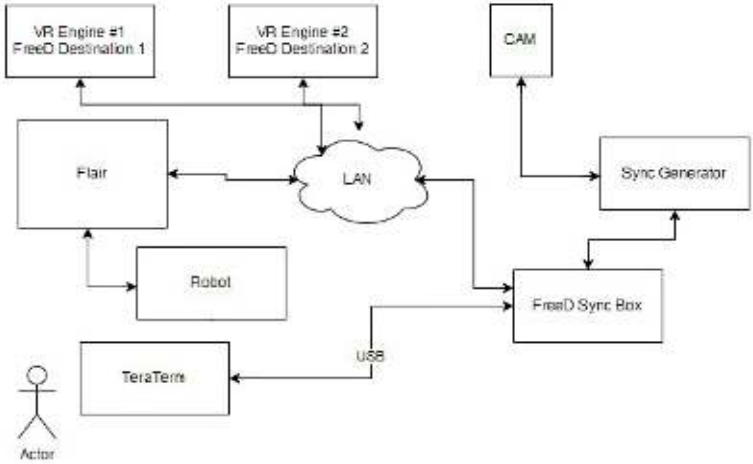


Changing the IP address of the FreeD box

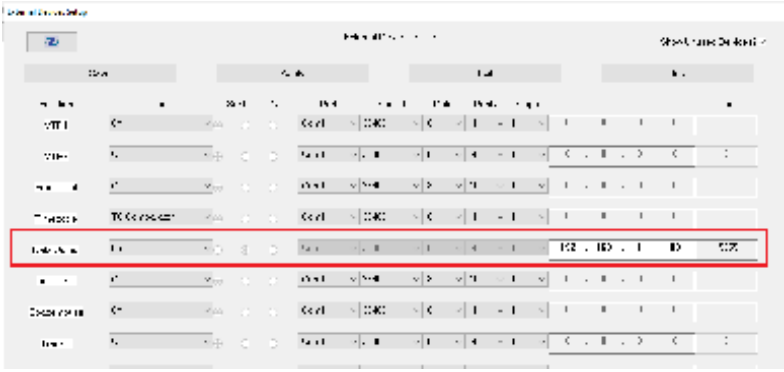
To change the IP address of the FreeD box, enter
AT+LIP=192.168.1.88

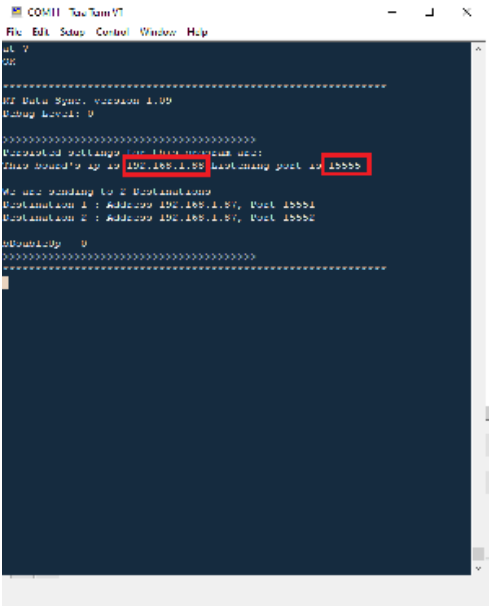
To change the port to **X**, enter
AT+LP=X

Testing the FreeD box in Flair Setup

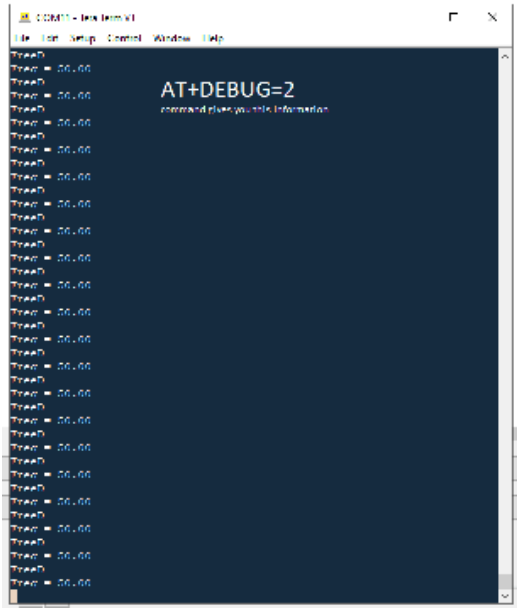


1. In Flair, select **Setups** > **Serial Devices** Setup. The External Devices Setup window appears. In the Data Output line, ensure that FreeD is selected and assigned to the same IP address and Port as that of the FreeD box.





2. **AT+Debug=2** command gives you the following information:



"**FreeD**" gets printed every time the box receives a FreeD message from Flair.

"**Freq**" determined by the Sync Generator (Genlock signal).

Disconnecting the genlock signal will change the frequency to 0.

Plug it back and the frequency change to 50 (if set to 50p).

Working with Local Area Networks

The Flair PC, nodes in Flair (such as lens boxes and track) and the FreeD box they communicate with each other through an Ethernet Local Area Network (LAN) are **devices** on the network. If you connect your MRMC equipment to a LAN or if you move this equipment between networks, you might need to change the LAN settings of the devices so that the devices not only work together, but do so when connected to another network.

Introduction to LAN addresses

Each device on an Ethernet network has a suite of three addresses:

- Internet Protocol (IP) address. This is the specific address within the LAN.
- Subnet (SN) address. This defines the size (address range) of the local area network, and should normally be set to the value shown in the next table.
- Gateway (GW) address. This is the address of the device used when talking between local area networks. This should normally be set to the value shown in the next table, and you would only change it if you needed to communicate with a head that is not on the same LAN as the controller.

Together, these addresses indicate the device's identity and location on the network. Each address is usually written as a group of four numbers separated by periods. The factory default values used in MRMC equipment are shown in the next table:

	Unibox	**Flair PC**
IP address	192.168.1.235	192.168.1.236
SN address	255.255.255.0	255.255.255.0
GW address	192.168.1.1	192.168.1.1

On a given local network, the last group of numbers in the IP address must be unique for each device. All other numbers and addresses must be identical.

The LAN addresses of the MRMC devices are **static**. That is, they will stay the same unless you explicitly change them.

> Hint
>
> Most local networks use the SN and GW values shown in the above table, so under ordinary circumstances you will only need to be concerned with **IP addresses**. The rest of this section therefore concentrates on **IP addresses**, but you might also need to inspect or change the SN and GW addresses, depending on the structure of the network that you are using to access the head.

Changing the IP Address of the Network Devices

The system will work ONLY if ALL IP addresses are in the same subnet, including the destination IP addresses.There are potentially the following IP addresses involved:

1. **The IP address of the Flair PC.** You don't ordinarily need to change this unless you are connecting it to a local network that requires different settings.
2. **The IP addresses of the nodes in NetworkDirect**. These are the IP address of the nodes in Flair such as the Unibox for lens motors and the Quad board in the track.
3. **The IP address of the FreeD box.** This is IP address that can be changed using Tera Term.

Flair PC

The default IP address of the Flair PC is 192.167.1.10. This is set in the INtime configuration.

To change this IP address:

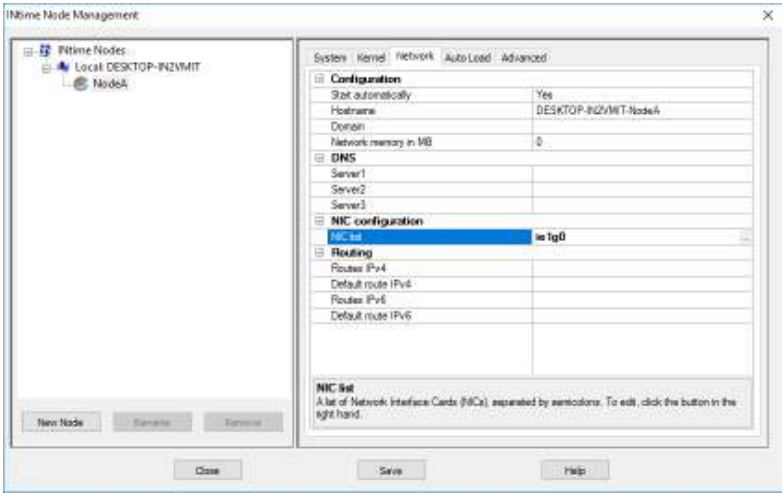
1. Right-click on INtime Status Monitor and select “INtime Configuration”.

INtime Status Monitor

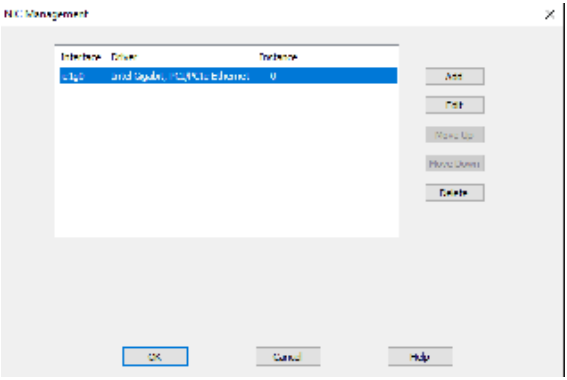
2. Double click on “Node Management”.

3. Select the “Network” tab.

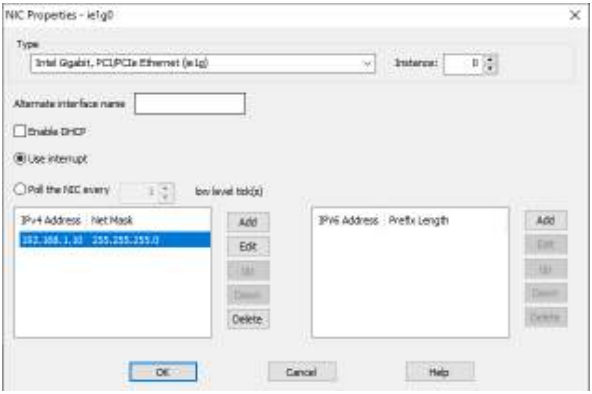
4. Hover the mouse over the network card in the “NIC list” to display the ellipses on the right side. Click on the ellipses to see the cards (should be only 1).



5. Select the NIC and click “Edit”.

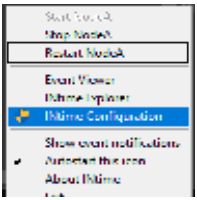


6. Select the IP address and select “Edit”.



7. Edit the IP address to the desired value. Save and close the dialog box.

8. Restart NodeA.



Nodes in Network Direct

The nodes in Network Direct in Flair include any lens boxes and track board. Ensure that you have the IP address of the Flair PC in the same subnet.

1. Select Setups > Network Setup in Flair to open the Network Setup in Flair.

2. Make sure that the node that you want to change is connected directly to the PC without any network hub.

3. Type the new address and click “Burn IP”.

4. Click “Save” and “Apply”.

5. Click the “Set IP” button to save the address in Flair.

6. Click “Save” and “Apply”.

7. Power cycle the node and click “Find” to check that the IP address has been changed (this only works if the flair PC is on the same subnet).

8. Repeat steps 1-7 for any other node whose IP address you want to change.

FreeD Box

1. Connect the box to the PC using the USB cable.

2. Open Tera Term (or any serial terminal).

3. Type “**`AR+setting?`**” to display current IP address.

4. To change the IP address of the board, type “**`AT+LIP=`***new address*”.

5. To change the port number, type “**`AT+LP=`***new port number*”

6. The same IP address and port number must be set in Flair in the “Serial Devices Setup” dialog box on the data output. For detail refer to Step 1 under *Testing the FreeD box in Flair Setup* on page 33.

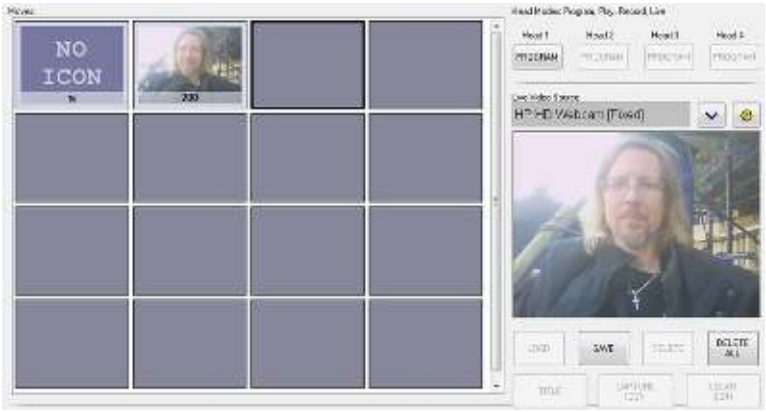
   If you want to change the address of the destination number *n* type “**`AT+IP=`***n,new address*”.

7. If you want to change the port number of destination *n* “**`AT+P=`***n, new port number*”.

Using Iconic Display in Flair

The Flair software interface can be changed to “Iconic” display for broadcast solutions where the users require to switch between many different moves. The Iconic display is a compact way of displaying multiple different moves in one screen and being able to rapidly pull moves up and execute them quickly. A Live Video source is very useful to be able to assign an image to each move which is represent by one of 16 icons on the left hand side of the screen. The right hand side of the screen shows the live feed and has buttons allowing you to read in a job from the icon, save the job and also title it or assign a video grab to that icon. You can also delete the job associated with an icon or even clear out all the jobs. Double clicking on a icon with read in the job associated with it.

To activate the Iconic display, add the following line in the ***Flair.ini*** file. This is normally done as part of factory settings by MRMC:
`*Iconic: 0`



Run Controls

Icons jobs are displayed and executed using the specialised run control bar at the bottom of the screen.

This control shows a timeline with time being used to designate the timing of the move and waypoints in the motion are displayed with small yellow circles suspended in the time line from the top. A full selection of controls allows you to run the move (Green Arrow) as well as move to the beginning and end of the move. The Double Arrow keys allow you to browse the move forwards and backwards while the arrows with a bar move you to the next and previous waypoints.

Getting Ready to Create a Position

1. Ensure that the robot is enabled:

   1.1 Release the E-stop and click the **Engage Robot** button in Flair.

   1.2 In Flair, enable the motors by selecting **Motors** > **Enable**.

2. Ensure that the lens is set up as Canon. Select **Setups**> **Lens Setup** and then select **Canon**. Click **Apply** and then click **Exit**.

3. From the main menu, select **View** > **Numeric** to switch to Numeric screen and in the Control Menu, select **Roll Level**. Switch back to the Iconic screen.

4. Press the **Select** button, on the LFP joystick to switch to **Carts View** mode. (Pressing again will switch to **Locked View** and pressing once more will switch to **Carts Off**.)

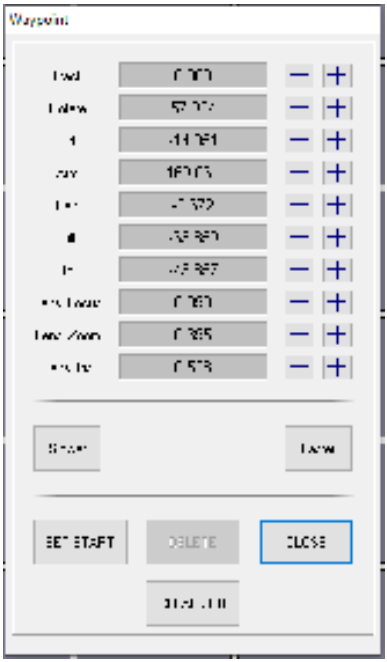
5. Ensure that the robot is engaged; the red light on the robot should be glowing.

Creating a Preset Position

1. Using the LFP joystick, move the robot to the position that you want to store as a preset position, or waypoint.

2. Click the **Waypoint** button on the bottom left of the Iconic screen to display the Waypoint dialog box.

3. In the Waypoint dialog box, click **Clear Job**. Click **Yes** in the confirmation message.



4. Click **Set Start**.
5. Select a box on the main screen where you want to store the preset position.
6. Click **Save** and specify a name for the preset position.
7. Click **Capture Icon** to save an icon for the position on the screen.

Running a Goto to the Preset Position

1. Double-click on the icon of the preset position on the Iconic screen
2. Click  to go to the preset position.
3. Click  . (This step is not mandatory but is advised.)

Creating a Move

1. First create a waypoint using steps 1-5 in section *Creating a Preset Position* on page 43.

2. Save the move by clicking the Save button and specify a name for the move.
3. Now move the robot to the end position and click **Set End** in the Waypoint dialog box.
4. Click **Save** and click **Yes** in the confirmation message.
5. Again by using the **Capture Icon** button, you can specify an icon for the move.

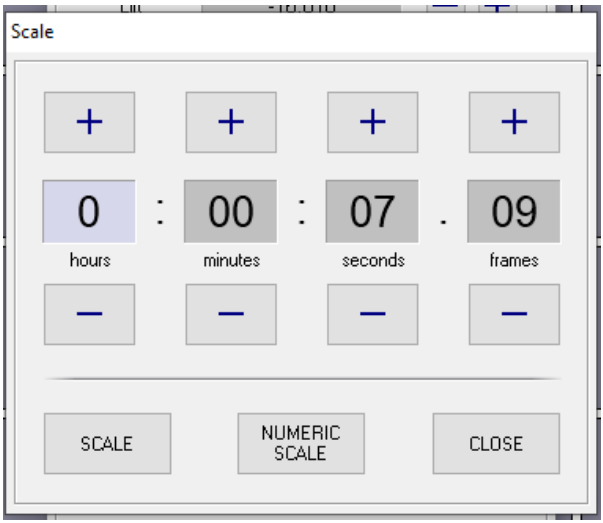
Running a Move

1. Double-click on the icon of the move on the Iconic screen to load the move.
2. Click  to go to the starting waypoint.
3. Click  to start shooting.

Modifying a Move

Changing the duration of the move

1. Load the move that you want to modify. (You can run it or stop the move.)
2. Click **Scale** on the bottom left corner of the Iconic screen.



3. Modify the duration as desired and click the **Scale** button in the dialog box.
4. Click **Close** to close the Scale dialog box.
5. Save the move.

Modifying one of the Waypoints in the Move

1. Load the move that you want to modify.
2. Click  to go to the starting waypoint.
3. Click  .
4. If you want to modify the first waypoint, ensuring that you are in Carts View mode, modify the position and save the move.
5. If you want to modify the second position, click  to move to the second waypoint.
6. Ensuring that you are in Carts View mode, move the robot to the new position and click **Update**.
7. Click **Save** to save the move.

Adding a Waypoint in the Move

A waypoint can only be added in the middle of two existing waypoints in the move.

1. Double-click the move to load it and do the goto.
2. Click  .
3. Click  or  to 'browse' to the frame where you want to add a waypoint.
4. Click  to exit browsing.
5. Move the robot to the desired position that needs to be added.
6. Click **Create** in the Waypoint dialog box.
7. Click **Update** and then **save** the move.

Moving the Studiobot TX90 arm by hand

In some circumstance you need to move the Studiobot TX90 arm manually with your own hands. For example:

- Recovering from a **software lock-up**. For example if momentum has carried the arm outside the soft limits, the software might refuse to move the arm to get back inside the limits.
- Recovering from a **hardware lock-up**. If momentum or a programming error moves the arm against its internal hard limits or if the camera platform gets stuck against another part of the arm, the motors might not be able to back off from this position without tripping out.
- Putting the arm into **transport position**, to make the Studiobot TX90 volume as small as possible so it will fit into a truck. You can do this with Flair software (although you will probably need to change the soft limits) but if you forget to do so before shutting down the Flair computer then you can do it by hand.

Transport position:

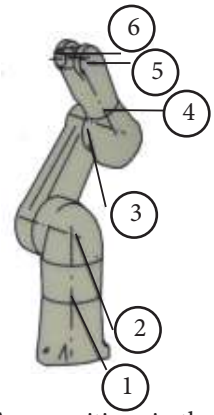
- Arm rotated forward and tucked under.
- Camera platform perpendicular to base slope, above the wheel unit, with about 3cm clearance between it and the base.

Hint

Moving the Studiobot TX90 arm by hand is usually a two-person job — one to operate the Brake Release switch and button and one to move the arm.

To move the Studiobot TX90 arm by hand:

1. Make sure that robot itself has power and is switched on. The brakes are **on** when the unit is switched **off**, so if you want to move the arm by hand, Studiobot TX90 must have power and be switched on.
2. If the robot is connected to a running Flair PC, click on the **Disengage Robot** button in Flair.
3. Person 1: Use the Brake Release Switch to select which Studiobot TX90 axis you want to move.



Axes positions in the Staubli arm

Brake Release Switch should be in the '0' position when not moving the robot by hand

4. Person 2: By hand, securely hold the portion of the arm that you want to move so it does not fall when you release the brake.
5. Person 1: Press and hold the Brake Release button.
6. Person 2: Move the arm by hand.
7. Person 1: Release the Brake Release button.
8. Repeat steps 3 to 7 to move all the axes you want.
9. When you have finished, turn the Break Release Switch to the '0' position, and power down.

Notes

Appendix 1 **Troubleshooting**

Typical symptoms, causes, and actions

Symptoms	Cause and/or action
Flair fails to establish a network connection to the Studiobot TX90 controller (the Stäubli CS8) over the **ETHERCAT** cable.	Try a different cable. The cable between the cifX boards in the Flair PC and Stäubli CS8 needs to be a high quality, fault-free, straight-through (that is, not cross-over) Ethernet cable. Check that all cables are connected correctly and that all devices, including the Ethernet hubs, have power. Check the order in which you are powering up the devices (page 18). Make sure you have allowed enough time for the Studiobot TX90/Stäubli CS8 unit to completely power up (with the cifX board lights displaying the correct pattern) before you double-click on the **Start Robot** icon on the Flair PC Desktop.
Studiobot TX90 won't move	Make sure you have enabled Studiobot TX90 in Flair (click on the **Engage Robot** button). Make sure all of your E-stop buttons are up, and that you have pressed the Reset button on each E-stop (if it has one). When they are all up, the Stäubli CS8 panel displays a "**U**". If you have moved the Studiobot TX90 arm by hand, make sure you have turn the Brake Release Switch in the robot arm back to '0' position when you have finished. For details see *Moving the Studiobot TX90 arm by hand* on page 47.

Checking robot temperature using the pendant

The robots efficiency might suffer if the temperature inside the cabinet is too high. To check the temperature:

1. Replace the bypass jumper from the Pendant connector in the Studiobot base with the Pendant connector on the teach pendant.

2. Select **Main Menu > Control Panel**. Press Enter.

3. Select **Controller Status** and press '→'.

4. The Cabinet Temperature is shown on the pendant screen.

Notes

Appendix 2 **Specifications**

Rig Weights

Dimensions	Studiobot TX90 on Track	Studiobot TX90 on Pedestal
Weight excluding Base	114kg	114kg
Weight - Base	180kg	
Power Supply Unit	50kg (110.2lbs)	50kg (110.2lbs)
Weight - anchor weights for track (when track is not bolted to the ground)	100kg on each corner	
Nominal robot payload	5.9kg (22lbs)	5.9kg (22lbs)

Rig Performance

Axis	Travel	Max Speed
Rotate (Axis 1)	±175°	100°/ second
Lift (Axis 2)	-55° to 215°	100°/ second
Arm (Axis 3)	-50° to 230°	100°/ second
Pan (Axis 4)	± 265°	200°/ second
Tilt (Axis 5)	-15° to 8°	200°/ second
Roll (Axis 6)	-200° to 240° (likely to change when camera mount rotated 180°)	200°/ Second
Track (Axis 7)	Unlimited	2.9 m/s
Camera speed (maximum)		1m/s

Operating Envelope

Description	Measurement
Small spacer height	150mm
Large spacer height	300mm
Maximum Height (From Ground)	2.8m/ 8'2" (with spacers) 2.3m/7'7"(without spacers)
Lowest Position	0.2m / 8"(without spacers)
Maximum reach (from rotate centre)	1.6m / 5'3"

Temperature range: 0-45 °C (32-113 °F)
Humidity tolerance: 0% to 85% relative humidity, non-condensing
Studiobot TX90 on Track power requirements: 230 Volts, 2x16 Amps, 50-60 Hz with Earth (Ground) connection.

Studiobot TX90 on Pedestal power requirements: 230 Volts, 16 Amps, 50-60 Hz with Earth (Ground) connection.

The Studiobot TX90 On Track requires single phase 230VAC, 50/60Hz plus Neutral plus Earth to run at maximum speed. The maximum **peak** current consumption at **230VAC** of the **Studiobot TX90 On Track** system is calculated to be **26 Amps (20A for the Track Unit and 6A for the Robot)**. This is the absolute theoretical maximum peak current with the track and all axis of the robot at max acceleration and would occur over a period no more than 2 seconds!

In industrial situations, where we are running large machinery, the breaker must be at least 100ma earth leakage, and preferably 300 ma. Otherwise the machine will not power up and will frequently trip the wall breaker whilst running, and you will not be able to shoot. If you have just fuses instead of a breaker, this will not be a problem.

Studiobot TX90 On Pedestal can be configured to run on less, with a proportionate drop in performance.
Transformer requirement: Two 3kW, 110-230V step-up transformers.

Optional power generator requirements: 6 kVA

Notes

Notes

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