Hardware Requirements:
The Utah Arm 3 uses Windows-based software and operates on any Windows OS, including XP.

**Step 1. Connect the Utah Arm Parts**

To connect the parts:

1. Connect the parts as per the diagram, connections may be made via the 1-, 3-, or 5-wire harness (5-wire shown).
2. To make adjustments using your computer, connect the Computer Interface Cable on the left side of the elbow, as shown, and the 5-pin connector to the back of your computer.
3. For Switch Options, refer to the Utah Arm Parts Catalog on the reverse side.

Check www.UtahArm.com for updates to these instructions.

**Step 2. Connect the Computer Interface**

1. Remove the safety cover for the Computer Interface connector on the U3 elbow.
2. Plug in the 4-pin connector from the Computer Interface.
3. Plug the Computer Interface into the 9-pin serial port at the back of your computer. If your computer does not have a serial port, you may need a USB-serial port adaptor. Order part #1800075 from Motion Control.

**Step 3. Load the Software**

1. Insert CD or 3.5" floppy disk into your PC and double-click on the file "U3PC2Inst.exe." A window will open asking if you want to install the program; click "Yes." The program will automatically load on your "C" drive when you click on "Unzip." if you specify otherwise (fig. 1).

2. You should now see two new icons on your desktop labeled "U3PC2" and "U3PC2 Demo." Choose Demo to practice. Choose "U3PC2" to begin using the software.

Note: If other Windows programs are running while using the User Interface software, your computer monitor may switch to a different viewing resolution. Your normal settings will return when you exit the program.

**Step 4. Use the Set Up Wizard**

- **Sequential hand and elbow control**
- **Dual-site EMG (same input for Elbow & Hand)**
- **Using a Motion Control Hand or ETD**

Simultaneous vs. Sequential:

**Simultaneous control:** The same as the U2—the Hand will operate when elbow is locked. Hand and elbow inputs may be the same or different.

**Sequential control:** Wearer can use the elbow and hand (or wrist) at the same time. Hand and elbow inputs must be different.

If using separate Hand and Elbow inputs, choose "Use separate input signals" and connect both inputs to the Wire Harness. If you choose "Use the same inputs," the ELBOW input will also be used for the Hand, when the elbow is locked.

**How the software is organized:**

Use the Set Up Wizard or take a shortcut directly to the adjustment screens.

**Quick Troubleshooting Guide:**

If you get the message "Unable to communicate..." check that the Arm is turned on, the computer connections are tight, and try another Comm port. If all else fails, try rebooting your computer, or the USB cable disconnected.
Elbow Adjustment screens

Set the forearm gains on the Arm itself to "5".

**Elbow Main Menu**

- Dual-Site EMG
- Freeswing/Relax
- Definition of each Control Type:
  - Dual Site EMG
  - Single Site EMG
  - Single Site Alternate Input

**User Settings**

- Toggle between options by clicking on the appropriate button:
  - "Polarity" reverses elbow direction
  - "Manual" lock/unlock - click to lock/unlock the elbow

**Screens available**

1. **Elbow Settings**
   - For making adjustments and patient training.
   - Screen name highlighted
   - To choose other screens, highlight by using the up and down arrow keys, then press "Enter"
   - Screen name highlighted

2. **Elbow Lock/Unlock**
   - Use this screen to help train wearer to switch between hand and elbow.
   - Input signals are shown to help with training.
   - To Unlock: First, relax until light goes on. Then co-contract so both target rates are exceeded. The border of the column flashes GREEN when co-contraction is successful.
   - Switch Window: Time allowed between A & B threshold crossings.

3. **Freeswing/Relax**
   - Freeswing occurs when muscle signals (A&B) fall below freeswing level.
   - Relax Time: Prevents accidental unlock by requiring a pause before switching.

**Definition of each Control Type:** (See also Step 4, other side)

1. **Dual Site EMG** (same as the U2/Arm): the difference between the A and B muscle signals controls the Elbow.
2. **Dual Site EMG First Over**: the elbow is controlled by the first muscle to contract over the threshold. NOT the difference between A and B. This is especially useful for the patient who cannot control each muscle independently. Reversing the direction of the Elbow requires the first muscle to relax below threshold.
3. **Single Site EMG**: Use when only one muscle site is available, or for initial training.
4. **Single Site Alternate Input**: (e.g., Force Sensor, Linear Potentiometer, etc.) - Used when no muscle EMG is available. Elbow (or Hand) power is proportional to the amount of input signal.

**Installation of each Control Type:** (Connect to Elbow input in wire harness)

1. **Dual Site EMG/EMG First Over**: Use standard dual site preamps.
2. **Single Site EMG/EMG First Over**: Use a Single site preamp or dual site preamps - the controller will use the "A" channel only. If you decide to use dual site control later, you can simply select it in the Set Up Wizard and both channels will be active.
3. **Single Site/Alternate Input**: Connect the Force Sensor with adaptor cable in place of preamp.
4. **Dual Site/Alternate Input**: Dual site Touch Pads are presently the only option. Connect to "elbow" input.

**How “Single Site EMG” and “Single Site Alternate Input” Works:**

Using the Single Site control options, increasing the signal raises the elbow and decreasing the signal lowers the elbow. The power to the elbow is proportional to the level of the input, so slow and fast speed is under the control of the wearer. When the signal is relaxed fully, the elbow will go into freeswing.

**Dual-site EMG inputs**

- **Elbow Lock/Unlock**
  - Same as dual site unlock, except with single input.
  - Note: Rate must be higher than Target Rate for both rising and falling signal. If difficult for the wearer, lower the Target Rate.

**Single-site EMG or Alternate input**

- **To adjust SS input:**
  1. Adjust "Input Gain" so that "Input Signal" reaches 100% with moderate effort.
  2. Adjust "Output Gain" so that elbow control is optimized.
  3. Adjust "Home Threshold" to prevent accidental motion of the elbow.

- **For SS Unlock:**
  - Same as dual site unlock, except with single input.

- **For Lock Override:**
  - "Override" is enabled or disabled when lock override button (on the arm) is pushed.

- **For Single Site:**
  - Freeswing and Relax adjustment is the same as for dual site EMG.

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For help on any screen, press F1.
Hand Adjustment screens

User Settings
Toggle between options by clicking on the button.
• Reverse Hand or Wrist direction

Enable Auto-Cal on “User Settings” screen
Gains and Thresholds will readjust.
Trigger Auto-Cal by:
1. Turn power off/on twice quickly.
2. Open and close the hand several times within 7 seconds.

Hand Main Menu

Store and Recall - with changes:
This screen appears automatically at screen exit whenever settings have been changed.

“Previous” settings are last saved settings.
“Adjusted” settings show any changes.

• To save and exit, click on PROCEED
• Recalls “original” settings from start of session
• To store or recall settings on the hard drive, use “Computer File Operations”

Computer File Operations:
To save adjusted settings into permanent memory on your computer. Follow on-screen directions to select a register, rename it, store settings, or retrieve settings. To retrieve settings, be sure Set Up Wizard has the same settings as when stored.

Single Site EMG or Alternate Input
• Home Threshold: determines when the Hand will start running, as the Input Signal is raised. Its purpose is to prevent unwanted motion of the Hand from small fluctuations of the input.
• Midpoint: This value is not adjustable. It functions as the reversal point for the Hand direction. Whenever the Input is lowered, and the signal falls below the Midpoint, the Hand direction reverses.
• Alternating Wrist Mode: When the U3 switches to Wrist (usually by co-contraction), you have the option of using Alternating Wrist Control. When this option is enabled, the Wrist will operate in each direction alternately. The direction of Wrist Control will reverse each time the Input Signal is relaxed for as long as the Sleep Time.

Relax Timer:
Relax Timer prevents accidental switching by requiring a pause before switching.
To switch between Hand and Wrist, muscles must first relax (input signals fall below thresholds) for the length of this setting, the Relax Time.
For wearers with difficulty relaxing, LOWER the time setting.

Switch Control
(If wrist is installed)
Fast Access: Wrist operates when one muscle contracts, with Rate above Target Rate.
Co-Contraction: A & B Switch Rates are above Target Rates PLUS A & B cross threshold together
External Switch: (option) See Parts Catalog
Note: A feedback “buzz” can be enabled on the User Settings screen to alert user when sleep occurs.

Switch Window
How close together (in seconds) muscle A & B must co-contract

Enable Auto-Cal on “User Settings” screen
Steps to adjust SS input:
1. Adjust “Input Gain” so that “Input Signal” reaches 100% with moderate effort.
2. Adjust “Output Gain” so that Hand control is optimized.
3. Adjust “Home Threshold” to prevent accidental motion of the Hand.

Switching with a Single Input:
Same as dual site, except with a single input. “Sleep” light must be on for switching to occur.
Note: A feedback “buzz” can be enabled on the User Settings screen to alert user when sleep occurs.

Sleep Timer
• Hand Delay Timer - Sets the length of time the Hand must stop for the Hand to “Sleep,” i.e., for the Power to turn off.
• Wrist Delay Timer - The Wrist will also “Sleep” after it is stopped for this Delay Time.
When Alternating Wrist Control is enabled (on the Settings screen), the direction of the Wrist Control will reverse each time the Wrist goes to sleep.
Note: A feedback “buzz” can be enabled on the User Settings screen to alert user when sleep occurs.

Computer File Operations:
To save adjusted settings into permanent memory on your computer. Follow on-screen directions to select a register, rename it, store settings, or retrieve settings. To retrieve settings, be sure Set Up Wizard has the same settings as when stored.