



## Instruction Guide of Programming Unit SP-52

### *Adjustment Procedure for the Intelligent Knee Series*

This guide refers to programming for the Intelligent Knee Series including the Hybrid Knee NI-C311, produced by Nabtesco Corporation, using the programming unit SP-52.


### I. PREPARATION

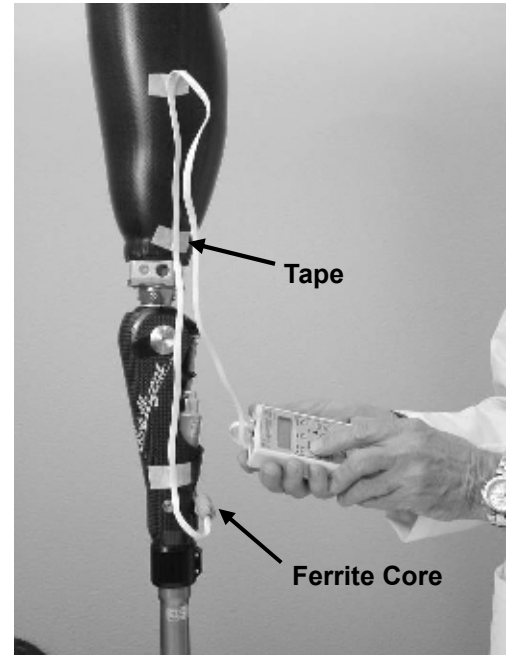
 *The knee unit must be properly aligned and the stance phase adjustment set before the programming.*

 *Before connecting, eliminate static electricity on your body by touching a table or the like, otherwise the circuit board on knee unit may have damage.*

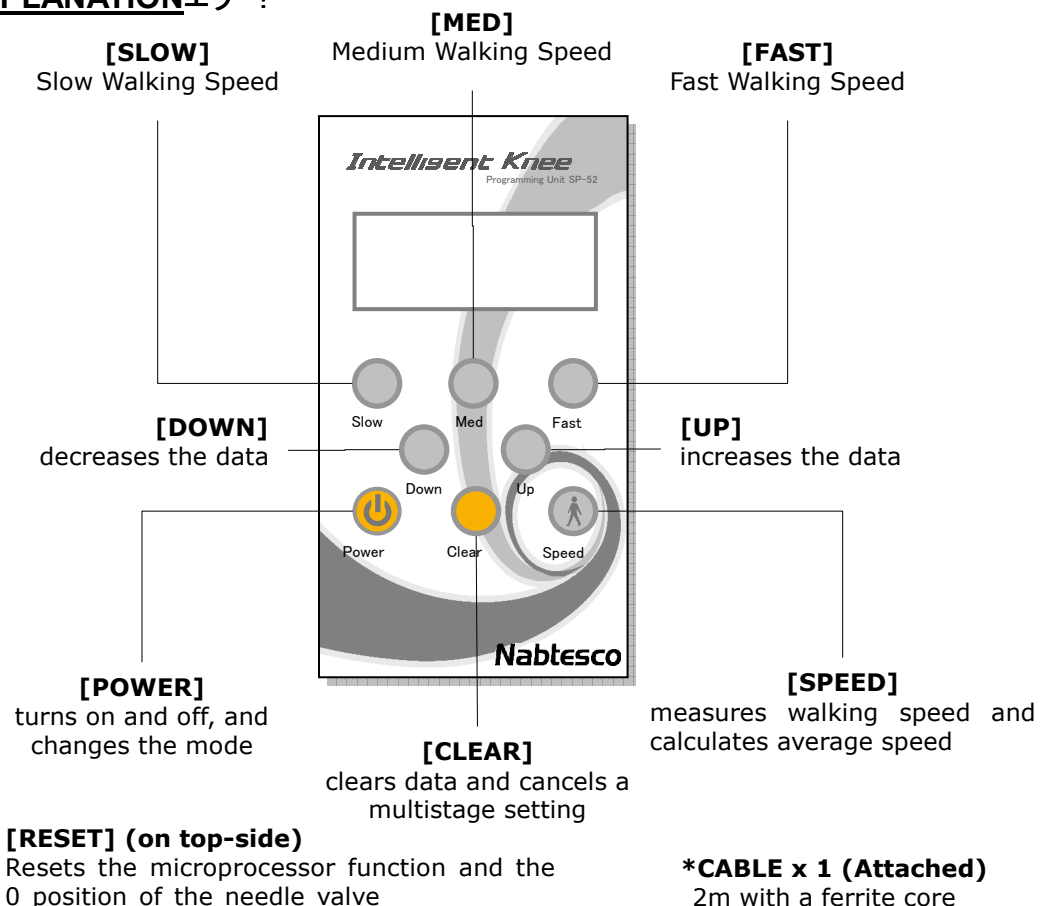
Connect the Programming Unit SP-52 with the knee joint by a cable attached. The cable should be set as the ferrite core side of connector should be connected to the knee unit.

Fix the cable by tape so that the cable may not disturb his/her walking.

 *You must use a specialized cable attached with the programming unit. The programming unit may not be used for the other devices other than Nabtesco Intelligent Knee series. An improper connection would cause failures of the products.*



### II. KEY EXPLANATION エラー!



### III. ADJUSTING PROCEDURES

#### a. ADJUSTING MODE

To program the swing phase control of the knee unit, base line data should be collected by having the user walk at Medium, Slow and Fast speed. Normally, programming for a knee unit can be accomplished only by this mode.

Display	Operation Procedure	Operating Key					
		SLOW	MED	FAST	UP/ DOWN	POWER	SPEED
HELLO! SP-52 rev.01 WAIT	Connect the adjuster to the knee joint, press the "POWER," then release it immediately. Wait for approximately two seconds.					⊙	
ADJUSTING MODE ↓ ADJ.MODE PRESS MED	Select the "MED" for normal walking.		⊙				
SELECT MV= 10	Perform a trial walk at medium speed (Initial value: 10) Select the optimum MV value for the knee swing using the "UP" and "DOWN" key.				⊙		
STEPS = 7 MT=---	Press the "SPEED" key several times, and select the "STEPS". (5 to 7 steps can be chosen.)						⊙
GO = 0 MT=120 V S > 10 > ? T ? > 120 > ?	Have the user walk at middle speed until "GO = 0" is shown, and measure the speed MT. Check the value of medium speed, and select the "SLOW" for slow walking.	⊙					
SELECT SV= 15	Perform a trial walk at slow speed, and select the optimum SV value for the knee swing using the "UP" and "DOWN" key. (Initial SV = MV value + 5 )				⊙		
STEPS = 7 ST=---	Press the "SPEED" several times, and select the "STEPS."						⊙
GO = 0 ST=160 V 15 > 10 > F T 160 > 120 > ?	Have the user walk at slow speed until "GO = 0" is shown, and measure the speed ST. Check the value of slow speed, and select the "FAST" for fast walking.			⊙			
SELECT FV= 05	Perform a trial walk at fast speed, and select the optimum FV value for the knee swing using the "UP" and "DOWN" key. (Initial FV = MV value - 5 )				⊙		
STEPS = 7 FT=---	Press the "SPEED" several times, and select the "STEPS."						⊙
GO = 0 FT= 80 V 15 > 10 > 05 T 160 > 120 > 80 ↑↓ OK:POWER OFF	Have the user walk at fast speed until "GO = 0" is shown, and measure the speed FT. When this message appears, press the "POWER" key.					⊙	
GOOD-BYE	Maximum 10-stage data is automatically calculated on the basis of the detected data, and is transferred to the circuit board on the knee unit. Then the power automatically turns OFF.						

### b. CONFIRMATION MODE

This mode allows you to check the programmed data in the knee unit. When the user walks, the current valve position can be displayed.

Display	Operation Procedure	Operating Key						
		SLOW	MED	FAST	UP/ DOWN	POWER	SPEED	
	Connect the adjuster to the knee joint. Press and hold the "POWER."					⊙		
HELLO! SP-52 rev.01	Keep to hold the "POWER" and Wait for approximately one second.					⋮		
<b>CONFIRM MODE</b>	When this message appears, release the "POWER."					⊙		
WAIT	Wait for approximately two second.							
CONFIRM MODE ↓ V1= 5 B1= 120	Press the "UP" or "DOWN" to display data stored to the knee joint.  After three seconds, the previous message will reappear.				⊙			
CONFIRM MODE V5= 9	While walking, the value on the second line varies with the walking speed.							
GOOD-BYE	Press the "POWER", turn off.					⊙		

### c. MANUAL MODE

By the Manual mode, the needle valve can set at a fixed position like a normal pneumatic knee joint. This mode is useful, for instance, when training.

Display	Operation procedure	Operation Key						
		SLOW	MED	FAST	UP/ DOWN	POWER	SPEED	
	Connect the adjuster to the knee joint, and press and hold the "POWER."					⊙		
HELLO! SP-52 rev.01	Wait for approximately two second.					⋮		
CONFIRM MODE	While this message is being displayed, keep it pressed.					⋮		
<b>MANUAL MODE</b>	When this message appears, release the "POWER."					⊙		
WAIT	Wait for approximately two seconds.							
MANUAL MODE V = 15	The value on the second line shows the current fixed valve opening. Press the "UP" and "DOWN" to select the optimum valve opening.				⊙			
GOOD-BYE	The power turns off. The valve opening is fixed. <i>Note: to set back the normal function, go into "ADJUSTING MODE" and then just turn off the power.</i>					⊙		

**d. COPY MODE**

Use Copy Mode to transfer stored data from one knee to another such as a loaner unit.

Display	Operation Procedure	Operation Key					
		SLOW	MED	FAST	UP/ DOWN	POWER	SPEED
	Connect the programmer to the knee unit. Press and Hold the "POWER" and "SPEED" keys simultaneously.					⊙	⊙
HELLO! SP-52 rev.01	Wait for approximately one second.					⊙	⊙
<b>COPY MODE</b>	When this message appears, release the "POWER" and the "SPEED".					⊙	⊙
WAIT	Wait for approximately two seconds.						
CHANGE IP! PRESS SPEED	Connect the programmer to another knee joint and press and the "SPEED".						⊙
PRESS SPEED TO WRITE!	Press the "SPEED" again for the confirmation.						⊙
GOOD-BYE	After written, the power is automatically turned off.						

**e. BATTERY CHECK MODE**

Total steps which the user has walked and the battery life estimated can be checked.

Note that once the battery plug was disconnected, the data as to total steps will be automatically reset.

Note that this function is available for all Hybrid Knee NI-C311 and the Intelligent Knee produced after December, 2005.

Display	Operation Procedure	Operation Key					
		SLOW	MED	FAST	UP/ DOWN	POWER	SPEED
	Connect the adjuster to the knee unit. Press and Hold the "POWER" and the "SPEED".					⊙	⊙
HELLO! SP-52 rev.01	Wait for approximately one second.					⊙	⊙
<b>COPY MODE</b>	While this message is being displayed, keep them pressed.					⊙	⊙
<b>EXTENSION MODE</b>	While this message is being displayed, keep them pressed.					⊙	⊙
<b>IP BAT CHK MODE</b>	When this message appears, release the "POWER" and the "SPEED".					⊙	⊙
WAIT	Wait for approximately two seconds.						
APPROX. 75% ■■■■■■■■■■	The value shows the approximate residual capacity of the knee's battery.						
STEP 1234567 REST 4345678	By pressing the "DOWN", the display shows total steps which the user has walked, and estimated rest of steps. <i>Note: the message will not be displayed in the case that value of the total steps is less than 100,000 steps.</i> Press the "UP" to go back to the previous indication.				⊙		
GOOD-BYE	Press the "POWER" to turn off.					⊙	

**f. EXTENSION MODE**

For fine adjustment of programming, use the Extension Mode. In this mode, the roles of the Keys are changed into as follows; "SLOW" Key → [SELECT], "MED" Key → [ENTER], "FAST" Key → [SAVE]

Display	Operation procedure	Operation key					
		SLOW	MED	FAST	UP/ DOWN	POWER	SPEED
	Connect the adjuster to the knee unit. Press and Hold the "POWER" and the "SPEED".					⊙	⊙
HELLO! SP-52 V01	Wait for approximately one second.						
COPY MODE	While this message is being displayed, keep it pressed.						
<b>EXTENSION MODE</b>	When this message appears, release the "POWER" and the "SPEED".					⊙	⊙
WAIT	Wait for approximately two seconds.						
EXT.MODE A= 0 D=120	The second line shows Address (A) and the Input Data (D) at the address.						
EXT.MODE A= 10 D= 5	Using the "UP" and "DOWN", go to the address to be changed.				⊙		
SELECT DATA! A= 10 D= 5	Press the "SLOW" to select the address.	⊙					
SELECT DATA! A= 10 D= 4	Then, using the "UP" and "DOWN", change the value of data.				⊙		
ENTER! A= 10 D= 4	Press the "MED" to enter changed data. If the other data needs to be changed, repeat the above procedure.		⊙				
SAVE ! A= 10 D= 4	After all data are changed, Press the "FAST" to save the data in the microprocessor.			⊙			
GOOD-BYE	Press the "POWER" key to turn off.					⊙	

**⚠ Caution:** Never change the data except at below-mentioned addresses. Adjustment without knowledge about the programming may cause malfunction of the knee control and trouble with the user's walking. After adjustment, reconfirm if the data were surely changed as intended..

Table Address and Data

ADRESS	DATA (Description)	ADRESS	DATA (Description)
A=00	B1: Fastest Boundary of Walking Speed	A=10	V1: Fastest Valve Position
A=01	B2: 2nd Boundary	A=11	V2: 2nd Valve Position
A=02	B3: 3rd Boundary	A=12	V3: 3rd Valve Position
A=03	B4: 4th Boundary	A=13	V4: 4th Valve Position
A=04	B5: 5th Boundary	A=14	V5: 5th Valve Position
A=05	B6: 6th Boundary	A=15	V6: 6th Valve Position
A=06	B7: 7th Boundary	A=16	V7: 7th Valve Position
A=07	B8: 8th Boundary	A=17	V8: 8th Valve Position
A=08	B9: 9th Boundary	A=18	V9: 9th Valve Position
A=09	255 (Terminal Data)	A=19	V10: 10th Valve Position
A=22	Valve Position when stopping (Default: MV Value)	A=23	Valve Position when voltage of battery drops (Default: MV Value)

**g. COM. MODE**

This mode is not available. This is used for manufacturer's purpose only.

**IV. ERROR MESSAGES AND TROUBLESHOOTING****ERROR MESSAGES****Message displayed: KNEE JOINT LOW BATTERY**

When: Turning on the power.  
 Cause: Exhausted battery of the knee joint.  
 Solution: Replace battery of the knee joint.  
Special Note: This message will be displayed when voltage of the battery in the knee joint is low.  
 This message may not appear if the knee unit has been left on for a long period of time.

**Message displayed: PROGRAMMER LOW BATTERY**

When: When power is turned on or during adjustment.  
 Cause: Exhausted battery of the programming unit.  
 Solution: Replace battery of the programming unit  
Special Note: This message will be displayed when voltage of the battery in the programming unit is low.  
 Replace the battery as soon as possible so that the data during programming may not be lost.

**Message displayed: COM. ERROR**

When: When power is turned on or during adjustment.  
 Cause: A) Exhausted battery of the knee joint.  
 B) Communication error between the programming unit and the circuit board of the knee unit.  
 1. Incorrect cable used.  
 2. Connection error.  
 3. Cable breakage.  
 4. Circuit board connected improperly.  
 5. Programming unit failure.  
 6. Dust or dirt on contact area.  
 Solution: A) Replace battery.  
 B) 1. Use proper cable supplied.  
 2. Insert connector fully.  
 3. Replace cable.  
 4. Press RESET key.  
 5. Replace programming unit.  
 6. Clean contact area and keep plastic plugs in place.  
Special Note: If error message disappears, resume normal use.  
 If "COM.ERROR" continues to be displayed and the power is shut off automatically, you need to press RESET once and turns the power on.

**Message displayed: ST<MT ERROR!**

When: After measuring ST data in Adjusting Mode  
 Cause: The order of walking data is not SLOW, and is faster than MED  
 Solution: Press the Speed key and Measure ST data again to correct the order of SLOW walking modes  
Special Note: If the problem cannot be solved by the solution, the walking data of MED may be too large (slow). Press CLEAR twice in succession to erase all the base line data. Then, load the basic data of MED again.

**Message displayed: MT<FT ERROR!**

When: After measuring FT data in adjusting mode  
 Cause: The order of walking data is not FAST and is slower than MED.  
 Solution: Press the Speed key and Measure FT data again to correct the order of FAST walking modes  
Special Note: If the problem cannot be solved by the solution, the walking data of MED may be too small (fast). Press CLEAR twice in succession to erase all the basic data. Then, load the basic data of MED again.

## **TROUBLESHOOTING**

**Use the following information if there is any trouble incurred during any phase of use.**

**Problem: No display appears when power supply is turned on.**

Cause: A) Battery of the programming unit not connected to unit properly.  
B) Battery of the programming unit exhausted.

Solution: A) Connect the battery correctly.  
B) Replace the battery.

**Problem: A) The display blinks.  
B) Abnormal marks appear.  
C) Display becomes weaker or disappears.**

Cause: Exhausted battery of the programming unit.

Solution: Replace battery of the programming unit.

**Problem: A) Display blackens and is difficult to read.  
B) Display is faint and difficult to read.**

Cause: A) Unit has been subjected to high or low temperatures for a long period of time.  
B) There is an adjustment error of the unit.

Solution: A) Place in room with temperature between 10° to 30°C for 1 hour.  
Replace battery if unit does not recover in that time period.  
B) Replace programming unit.

**Problem: Display appears only while the power key is being pressed, and disappears when released.**

Cause: A) Battery in the knee joint is not connected.  
B) Battery in the knee joint is exhausted.

Solution: A) Connect the battery in the knee joint.  
B) Replace the battery in the knee joint.

*If display reads "LOW BATTERY" or "COM.ERROR," refer to the section of Error Messages.*

### **Problems during "MANUAL MODE" and / or "ADJUSTING MODE"**

**Problem: Swing speed of the prosthesis does not change when data is changed.**

Cause: A) Battery is not connected to the knee joint.  
B) "0" position error of needle valve.  
C) Battery in the knee joint is exhausted.  
D) Cylinder module circuit board, motor, or needle valve has been damaged.

Solution: A) Connect the battery to the knee joint  
B) Press the RESET key. Press the again key again if the first pressing not effective.  
C) Replace battery in knee unit.  
D) Contact with supplier.

**Problem: The remaining step indicator does not count down when walking speeds are measured.**

Cause: A) Proximity sensor not connected.  
B) Damage to proximity sensor, connection, or magnet.

Solution: A) Contact with supplier  
B) Contact with supplier

*If the display reads "ST<MT ERROR!" or "MT<FT ERROR!", refer to the section for ERROR MESSAGES.*



**Problems during CONFIRMATION MODE**

**Problem: Terminal Impact is too hard.**

Cause: Adjustment set too soft.

Solution: Turn terminal impact adjustment screw clockwise to increase the dampening within the knee reaches full extension.

**Problem: The prosthetic knee cannot reach full extension.**

Cause: Terminal Impact Adjustment set too hard.

Solution: Turn terminal impact adjustment screw counterclockwise to obtain full extension.

**Problem: The swing of the prosthesis does not coordinate with a speed change.**

Cause: A) Connection to the battery, motor or proximity switch is loose  
 B) Battery in knee unit is exhausted.  
 C) Damage to proximity switch or magnet.  
 D) Pneumatic cylinder faulty.

Solution: A) Insert connector fully.  
 B) Replace battery of knee unit.  
 C) Contact with supplier  
 D) Contact with supplier

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