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## TECHNICAL NOTE TN-1032-AN

### Implementing Channel Increment and Decrement on the TB7100

15 August 2005

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#### Applicability

All TB7100 User Interface (UI) PCB's with IPN 220-02076-05 or earlier

## 1. Introduction

The TB7100 is capable of performing a channel 'Increment' and 'Decrement' functionality via the Function 1 (**F1**) and Function 2 (**F2**) buttons on the front of the base station 'User Interface' (referred to as **UI** for the remainder of this Technical Note).

There is however, an issue with the modification details included in the 'Installation and Operation Manual' Page 106, and performing *only* this modification *will not* enable the Increment and Decrement feature. This is due to a hardware design error on the UI board.

Fitting the resistors R60 and R62 as per the manual does connect the Increment and Decrement function lines as required however this modification does not disconnect the programmed F1 and F2 key functionality. Consequently the TB7100 attempts to action both operations simultaneously. (i.e Function 1 + Channel Decrement, Function 2 + Channel Increment).

As F1 and F2 have priority in the radio firmware, even when these keys are set to not perform any function in the programming application, they cancel the Increment and Decrement operation.

Therefore, further modification is required to electrically disconnect the standard F1 and F2 control lines from the F1 and F2 UI buttons.

Alternatively Digital I/O can be utilised to perform the same task. This does however use two digital inputs and two digital inputs/outputs from the I/O resource pool.

This technical note will describe both methods available to implement this feature.

## 2. Method 1 – UI Hardware Modifications

#### Modifications required

There are three steps to the modification required to implement the Channel Increment and Decrement feature. They can be carried out without the requirement of removal of the UI PCB.

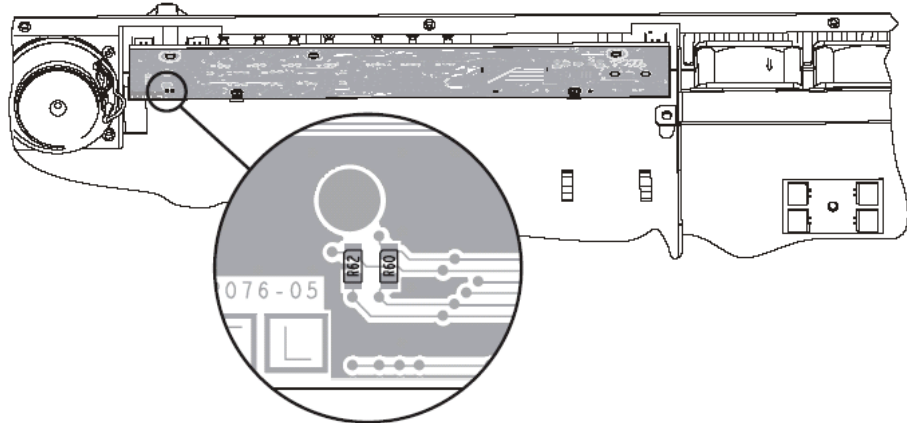
***Note - Due to the nature of these modifications, in particular the track cutting, it may prove difficult to reverse the modifications once they are carried out.***

#### Tools Required

- Soldering Iron
- 2 x Zero Ohm resistors (IPN 038-10000-00)
- Thin Linking wire (~25mm required length)
- Static Strap
- Scalpel, scribe or other suitable sharp track cutting tool

**Step 1**

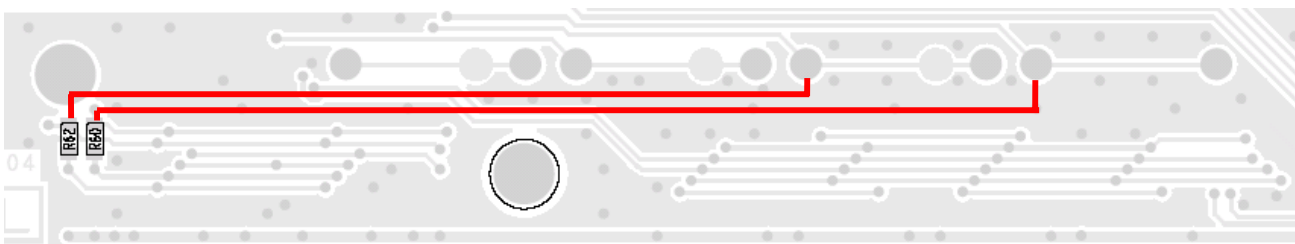
Fit 2 x zero ohm resistors in positions R60 and R62 as shown below. The zero ohm resistors can be substituted with solder shorts if this is found to be easier, however as tracks run between these pads a resistor is recommended.

**Step 2**

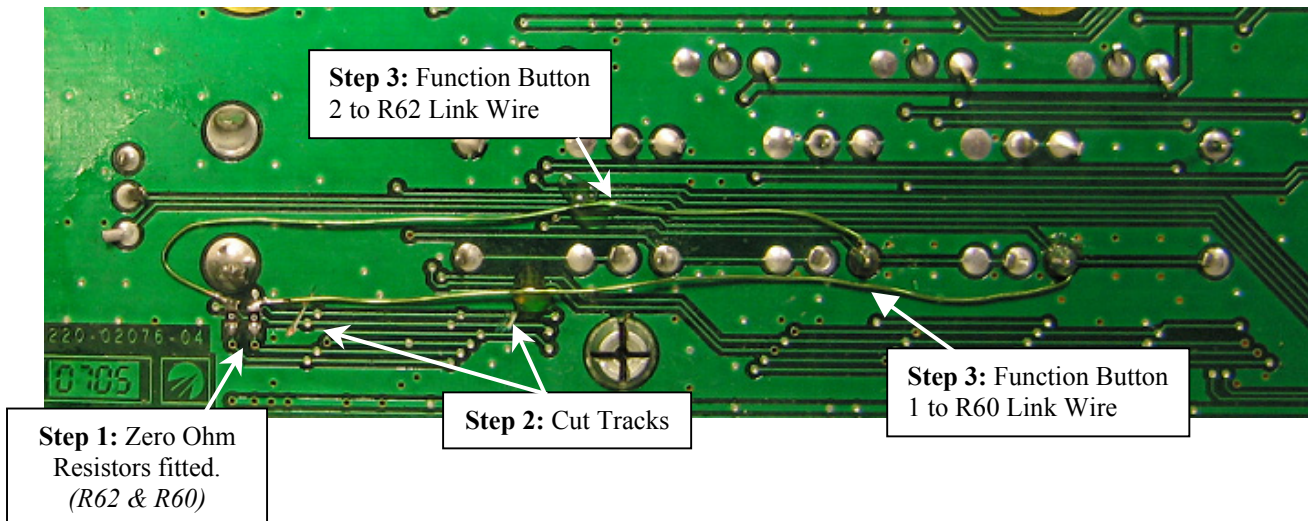
Two tracks require cutting in two locations. This can be achieved using a sharp blade or similar cutting instrument. The locations to make the track cuts are shown below.

**Step 3**

Linking wires need to be fitted to the UI to connect R62 to Function Button 2, and R60 to Function Button 1. This is achieved by soldering one end of the wire to either end of the named resistor, and soldering the other end of the wire to the appropriate leaded button leg on the rear of the UI board. The configuration/layout is shown below.



A photograph of a modified unit is included below that illustrates all the required modifications.



### 3. Method 2 – I/O Configuration

#### Items Required

- Soldering Iron
- 1 x 25 Way Male connector & housing (IPN 240-00010-63 & 240-06010-17)
- Linking wire
- Static Strap

#### DB25 Connection

Solder a link wire between the following points on the 25 way Male Connector.

**Pin 2 → Pin 10** (*DIG\_IN1 to TXDIG\_OUT1*)

**Pin 3 → Pin 12** (*DIG\_IN2 to TXDIG\_OUT2*)

Also ensure **W302, W300, and W301** are removed from the System Interface (SI) pcb.

#### Digital I/O Configuration

Configuration –

- Set AUX\_GPI1 and AUX\_GPI2 on both the Receiver and transmitter modules to be 'Inputs', with one set to the action of 'Increment Channel', and the other to 'Decrement Channel'.
- Set AUX\_GPIO5 and AUX\_GPIO6 in the Transmitter to be 'Outputs', with one set to the action of 'F3\* Key Status', and the other of 'F4\* Key Status'.  
(\* **Note** - these keys can be any of the four available, F3 & F4 are only included as an example)
- Set the 'Function Key Actions' of the keys used for Channel Increment and Decrement to 'None' in both modules.

## Example Programmable I/O Configuration

**Note below** - Red arrows highlight the important entries in the table.

The screenshot shows the 'Programmable I/O' configuration window in the TB7100 Programming Application. The window is divided into a table of I/O pins and an 'Action Parameters' section. The table has the following columns: Pin, Direction, Label, Action, Active, Debounce, Signal State, and Mirrored To. The 'Mirrored To' column for several rows is highlighted with red arrows, indicating important entries.

Pin	Direction	Label	Action	Active	Debounce	Signal State	Mirrored To
AUX_GPI1	Input	RT_DI_1	Increment Channel	Low	10	None	None
AUX_GPI2	Input	RT_DI_2	Decrement Channel	Low	10	None	None
AUX_GPI3	Input	RT_DI_3	No Action	Low	10	None	None
AUX_GPI4	Input	RT_DIO_1	No Action	Low	10	None	None
AUX_GPI05	Output	R_DIO_1	F1 Key Status	Low	None	Momentary	None
AUX_GPI06	Output	R_DIO_2	F2 Key Status	Low	None	Momentary	None
AUX_GPI07	Output	RXGATE	Busy Status	High	None	None	None
IOP_GPI01	None	PIN_9	No Action	None	None	None	None
IOP_GPI02	None	PIN_10	No Action	None	None	None	None
IOP_GPI03	None	PIN_11	No Action	None	None	None	None
IOP_GPI04	None	PIN_12	No Action	None	None	None	None
IOP_GPI05	None	PIN_13	No Action	None	None	None	None
IOP_GPI06	None	PIN_14	No Action	None	None	None	None
IOP_GPI07	None	PIN_15	No Action	None	None	None	None
CH_GPI01	None	C_HEAD	No Action	None	None	None	None

The 'Action Parameters' section includes the following settings:

- Emergency Mode: Stealth
- Unmute Audio Output: Speaker Audio Path
- Mute Audio Input: Audio Tap In
- Mute Audio Output: Speaker Audio Path
- Home Channel: 1
- Preset Channel: 1

## 4. Additional Information

### Using Channel Increment & Decrement during transmission.

It is important not to operate the channel increment and decrement while transmitting from the Base Station.

This is because during transmission, the Transmitter module will not respond to a channel change request, however the Receiver Module will. This will cause the channel numbers of the two modules to be out of synchronisation.

To recover from this situation should this occur, perform the following –

- I. Switch the Tx/Rx switch on the UI to monitor the Transmitter. Note the transmitter channel number.
- II. Switch the Tx/Rx switch on the UI to monitor the Receiver.
- III. Key up the transmitter.
- IV. Use the Increment/decrement keys to make the Receiver channel number align with the transmitter channel number.
- V. Return the transmitter to an idle state.

**Note – It is advised the same quantity of channels are programmed into both the Receiver and Transmitter modules with duplicate channel I.D's, as differing quantities of channels per module can also cause channel synchronisation issues when using the channel increment/decrement feature.**

## Individual Channel Increment and Decrement Buttons for both the Receiver and Transmitter.

With modification method 2, there is an additional option of having two function buttons controlling the channel increment/decrement of the Receiver, and two buttons controlling the channel increment/decrement of the Transmitter.

This however utilises four digital outputs and four digital inputs.

To achieve this you will initially have to carry out the operation described in section three of this tech note - Method 2 – I/O Configuration. Then carry out the procedure described below.

Firstly solder two additional link wires to the 25-way d-range.

**Pin 6 → Pin 19** (DIG\_IN3 to RXDIG\_OUT1)  
**Pin 7 → Pin 22** (DIG\_IN4 to RXDIG\_OUT2)

## Additional I/O Configuration

Configuration –

- Set AUX\_GPI1 and AUX\_GPI2 'Direction' in the Receiver to be 'None'.
- Set AUX\_GPI3 and AUX\_GPI4 'Direction' in the Transmitter to be 'None'.
- Set AUX\_GPI3 and AUX\_GPI4 on the Receiver module to be 'Inputs', with one set to the action of 'Increment Channel', and the other to 'Decrement Channel'.
- Set AUX\_GPI5 and AUX\_GPI6 in the Receiver to be 'Outputs', with one set to the action of 'F1\* Key Status', and the other of 'F2\* Key Status'.

(\* **Note** - these keys can be any of the four available, F1 & F2 are only included as an example as 3 and 4 were used in the example set-up covered in section 3 of this tech note.

As all four function buttons will be utilised for this functionality, all 'Function Key Actions' must be set to 'None' in both the Receiver **and** Transmitter Modules)

## Example Programmable I/O Configuration

Programmable I/O								
Digital   Audio   BCD								
Pin	Direction	Label	Action	Active	Debounce	Signal State	Mirrored To	
AUX_GPI1	None	RT_DI_1	No Action	None	None	None	None	
AUX_GPI2	None	RT_DI_2	No Action	None	None	None	None	
AUX_GPI3	Input	RT_DI_3	Increment Channel	Low	10	None	None	
AUX_GPI4	Input	RT_DIO_1	Decrement Channel	Low	10	None	None	
AUX_GPI5	Output	R_DIO_1	F1 Key Status	Low	None	Momentary	None	
AUX_GPI6	Output	R_DIO_2	F2 Key Status	Low	None	Momentary	None	
AUX_GPI7	Output	RXGATE	Busy Status	High	None	None	None	
IOP_GPI01	None	PIN_9	No Action	None	None	None	None	
IOP_GPI02	None	PIN_10	No Action	None	None	None	None	
IOP_GPI03	None	PIN_11	No Action	None	None	None	None	
IOP_GPI04	None	PIN_12	No Action	None	None	None	None	
IOP_GPI05	None	PIN_13	No Action	None	None	None	None	
IOP_GPI06	None	PIN_14	No Action	None	None	None	None	
IOP_GPI07	None	PIN_15	No Action	None	None	None	None	
CH_GPI01	None	C_HEAD	No Action	None	None	None	None	

Example Receiver Configuration

Programmable I/O								
Digital   Audio   BCD								
Pin	Direction	Label	Action	Active	Debounce	Signal State	Mirrored To	
AUX_GPI1	Input	RT_DI_1	Increment Channel	Low	10	None	None	None
AUX_GPI2	Input	RT_DI_2	Decrement Channel	Low	10	None	None	None
AUX_GPI3	None	RT_DI_3	No Action	None	None	None	None	None
AUX_GPI04	None	RT_DIO_1	No Action	None	None	None	None	None
AUX_GPI05	Output	T_DIO_1	F3 Key Status	Low	None	Momentary	None	None
AUX_GPI06	Output	T_DIO_2	F4 Key Status	Low	None	Momentary	None	None
AUX_GPI07	Input	TXKEY	External PTT 1	High	2	None	None	None
IOP_GPI01	None	PIN_9	No Action	None	None	None	None	None
IOP_GPI02	None	PIN_10	No Action	None	None	None	None	None
IOP_GPI03	None	PIN_11	No Action	None	None	None	None	None
IOP_GPI04	None	PIN_12	No Action	None	None	None	None	None
IOP_GPI05	None	PIN_13	No Action	None	None	None	None	None
IOP_GPI06	None	PIN_14	No Action	None	None	None	None	None
IOP_GPI07	None	PIN_15	No Action	None	None	None	None	None
▶ CH_GPI01	None	C_HEAD	No Action	None	None	None	None	None ▼

Example Transmitter Configuration

## Compliance Issues

None

## CSO Instruction

Please advise technical staff of this additional hardware modification requirement and/or software configuration.

## 5. Issuing Authority

### Name and Position of Issuing Officer

Paul Hinton  
Technical Support Engineer

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### Document History

Original Release	01 June 2005	PH
Addition of Method 2	15 August 2005	PH