Command:BCUSTOM (BCA)

MS2000 or RM2000 syntax

Shortcut	BCA
Format	BCA [X = @ Normal Press] [Y = @ Long Press] [Z = @ Extra Long Press] [F = Home Long Press] [T = Home Extra Long Press] [R = JS Normal Press] [M = JS Long Press]
Units	Integer code (see table below)
Firmware Version Required	9.2g+
Remembered	Automatically on power down. Not affected by SS Z or SS X. Before version 9.2m, SS Z used to save settings.

Tiger syntax

Shortcut	BCA
Format	[addr#]BCA [X = @ Normal Press] [Y = @ Long Press] [Z = @ Extra Long Press] [F = Home Long Press] [T = Home Extra Long Press] [R = JS Normal Press] [M = JS Long Press]
Units	Integer code (see table below)
Type	Card-Addressed
Firmware Version Required	3.0+
Remembered	Automatically on powerdown. Not affected by [addr]SS Z or [addr]SS X. Before version 3.3, [addr]SS Z used to save settings.

In `Tiger` version 3.0+ and MS2000 version 9.2g+ the Button Function assignment has been rewritten to be more flexible. Every possible button function is now assigned a number. This function can be assigned to any button (@, Home, and Joystick Button) and any press duration (Normal, Long and Extra Long Press) through the BCA commands X, Y, Z, F, T, R, and M arguments.

The settings of BCUSTOM are automatically saved in non-volatile memory when changed, they will be available even on controller restart.

As of `Tiger` version 3.18 and MS2000 version 9.2l a button function can be initiated over serial using the BE F command (BENABLE). The function doesn't need to be assigned to a particular button for this to work. Note: this function does not interact with the `button_flag_byte`, use EXTRA M=# if you need that functionality.

> **Note:** The behavior of this command is very different pre-Tiger version 3.0 and MS2000 version 9.2g

As of MS000 version 9.2m+ and `Tiger` v3.35+, it's possible to assign button functions to Home Normal Press and Joystick Extra Long Press using the BENABLE command. The parameters **R** and **T** are used, and follow the same behavior as BCUSTOM. The parameter **M** to sets the

`Zero/Halt Normal Press` button function with BENABLE M=#.

Note: The `Zero/Halt` button will always halt all axes on a button press unless you set the button function to `0 - No Function Performed`, which disables the halting routine. The halting routine happens as soon as you press the button, not in the release handler.

Example: #BENABLE R=0 to disable the home button normal press, where # is the Tiger card address.

Button Press Duration:

```
The amount of time that a button is held down determines the type of button
press.
* 0 to 1 seconds: Normal Press
* 1 to 3 seconds: Long Press
* 3 or more secs: Extra Long Press
```

Button Function Table

The table below lists and describes all possible button functions

No	Function
0	No function performed
1	Unused Button Function
2	Toggles Knob between two axis, like Z and F
3	TRACKING, CRISP, LSRTRK related, short press functions. Steps from IDLE to Calibration states to lock and unlock state.
4	CLOCKED DEVICE related, moves clocked devices like Turret and slider to next position.Note, if there are multiple clocked devices on the same card or controller, all of them are moved. For more specificity see 36 and 37 below
5	ARRAY MODULE related,same as Command:ARRAY (AR). When TTL X=7 does move to next array position.
6	RING BUFFER related, move to next ring buffer position; On TGLED card, button press mimics TTL pulse verion 3.24+.
7	SCAN MODULE related, halts scan move
8	AUTOFOCUS related, performs autofocus routine.
9	Unused Button Function
10	AT_XYZ_KNOB related, changes XYZ knob state. Cycles knob control between X, Y, and Z axes.
11	AT_XYZF_KNOB related, changes XYZF knob state. Cycles knob control between X, Y, Z, and F axes.
12	ZLOADER related, Moves Z away from the sample, to its upper limit, and back. For loading samples. Only available on MS2000.
13	CRISP and TRACKING related, performs CRISP very long press functions
14	ADEPT related, toggles between piezo external and internal input mode
15	CRISP and TRACKING related, performs CRISP long press functions. Stops current CRISP operation like stop dither, unlock etc.
16	ARRAY MODULE related, puts ARRAY Module in start state
17	Unused Button Function

No	Function
18	RING BUFFER related, loads current stage positions of all axes into ring buffer
19	AT RAMM LOAD related, moves Y and F axis to their upper and lower limits.
20	SCAN MODULE related, puts SCAN MODULE is start state
21	AUTOFOCUS related, performs autofocus calibration
22	ZOOM related, sets up zoom profile
23	PLANAR CORRECTION related, sets planar correction points
24	RING BUFFER related, clears ring buffer
25	TOGGLE ALL AXES related, swaps knob control between two axes.
26	TRACKING related, short press function
27	JS PULSE related, sets TTL in ready state
28	JS_FASTSLOW related, toggles joystick speed between fast and slow
29	PLANAR CORRECTION related, resets planar correction
30	CLOCKED DEVICE related, moves clocked devices like Turret and slider to previous position. Note, if there are multiple clocked devices on the same card or controller, all of them are moved. For more specificity see 38 and 39 below
31	JS_FASTSLOW related, sets joystick speed to fast
32	JS_FASTSLOW related, sets joystick speed to slow
33	LED related, increase LED intensity
34	LED related, decrease LED intensity
35	LED related, toggle LED ON and OFF
36	CLOCKED DEVICE related, moves the FIRST clocked devices like Turret and slider to next position. Similar to option 4
37	CLOCKED DEVICE related, moves the SECOND clocked devices like Turret and slider to next position. Similar to option 4
38	CLOCKED DEVICE related, moves the FIRST clocked devices like Turret and slider to previous position. Similar to option 30
39	CLOCKED DEVICE related, moves the SECOND clocked devices like Turret and slider to previous position. Similar to option 30
40	HOME related, issues a Command:HOME on all axis motors MS2000 9.2n and Tiger v3.36 firmware
41	ZERO related, issues a Command:ZERO on all axes. MS2000 9.2n and Tiger v3.36 firmware
42	Repeats the last issued relative move Command:MOVREL MS2000 9.2o firmware

Deprecated Button Functions

1	~~Smart Move related~~ This function no longer exists, removed in Tiger 2.5 and MS2000 9.2p
9	~~CRIFF related, toggle CRIFF lock~~ This function no longer exists, CRIFF was replaced by CRISP.
17	~~CRIFF related, change CRIFF state.~~ This function no longer exists, CRIFF was replaced by CRISP.

Example:

Take a firmware build like STD_XY. This firmware is packed with modules such as:

- RING BUFFER module
- JS_FASTSLOW, joystick button press toggles joystick speed between fast slow.

In a build like this there are a lot of modules fighting for control of the buttons. There is a priority list that sets up the defaults button function. Lets Query the controller on what the default assignments

ended up being.

Tiger Example

```
1BCA X? Y? Z? F? T? R? M?
X=0 Y=0 Z=0 F=0 T=0 R=28 M=18
X: @ Normal
Y: @ Long
Z: @ Ext Long
F: Home Long
T: Home Ext Long
R: Js btn Normal
M: Js btn Long
<LF>
```

MS2000 Example

```
BCA X? Y? Z? F? T? R? M?
X=0 Y=0 Z=0 F=0 T=0 R=28 M=18
X: @ Normal
Y: @ Long
Z: @ Ext Long
F: Home Long
T: Home Ext Long
R: Js btn Normal
M: Js btn Long
<LF>
```

So @ normal press, does nothing @ long press, does nothing @ extra long press, does nothing Home long press, does nothing Home extra long press, does nothing Joystick button normal press, toggles joystick speed Joystick button long press, loads current position into ring buffer.

If user wants the Ring Buffer to be more prominent, then following command can be issued.

Tiger Example

```
1BCA X=6 F=24 R=18 M=28
:A
<LF>
```

MS2000 Example

```
BCA X=6 F=24 R=18 M=28
:A
<LF>
```

Now, @ normal press, moves to next ring buffer position Home long press, clear the ring buffer

Joystick button normal press, loads current stage position into ring buffer Joystick button long press, and toggles joystick speed.

Tiger example scenario

```
30: Comm v3.26 TIGER_COMM Apr 09 2019:15:52:41
31: X:XYMotor,Y:XYMotor v3.25 STD_XY_LED Mar 18 2019:15:56:27
32: Z:ZMotor,S:Slider v3.26 STDZ_SLDR8 Apr 30 2019:08:40:35
33: O:Tur v3.26 TURRET_SINGLE Apr 30 2019:08:41:10
```

A user with a Tiger system in the above configuration has two clocked position devices. A filter slider on card #2 and turret on card#3. They would like to move these devices with button presses. Lets set it up so that on short '@' button press (less than 1-sec press) Filter slider moves, then on long'@' button press (1 to 3-sec press) the turret moves. The button function that does this is '# 4' (see the table above). '@' short press assigned with 'X' variable, and '@' long press is assigned with 'Y' variable.

2BCA X=4 Y=0 , this tells card#2 which drives the filter slider to respond to short @ press with slider move, and ignore any long @ button presses.

3BCA X=0 Y=4 , this tells card#3 which drives the turret to respond to long @press with turret move and ignore any short @ button presses.

1BCA X=0 Y=0 , this tells card#1 which drives XY stage to ignore any short or long @ button presses.

Try it out. If you like the behavior, commit it to systems onboard memory with serial commands

```
1SS Z
2SS Z
3SS Z
```

More info on SS Z command is here, http://www.asiimaging.com/docs/commands/saveset

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