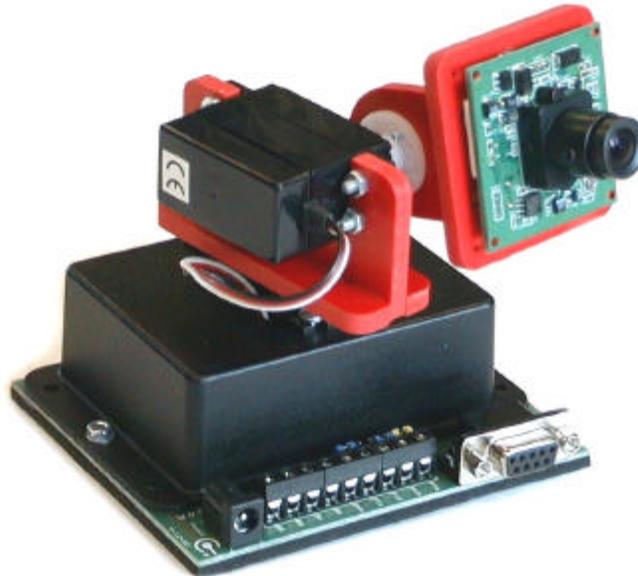


## Pan and Tilt Module with Controller



Camera not included

### **Summary**

The Pan and Tilt module has been designed for use with standard pcb mounted video capture cameras and micro weight WebCams. Using standard hobby servos, it will allow the user to control the position of the camera in both the pan and tilt axes over a sector of approximately 130°. The Pan and Tilt module provides 3 selectable modes of operation-

- direct control mode, eg as a WebCam drive under PC control,
- autonomous stepping mode - the module moves the head to between 2 and 8 pre-defined nodes,
- autonomous slewing mode- the module continuously scans a defined sector

The module is controlled and programmed by a simple ASCII command set and may be set-up from within a simple terminal programme such as Hyperterminal or the supplied Windows software.

All adjustable operating parameters are stored in non-volatile memory so that they are retained during power down.

Provision is made for up to 4 "normally-closed" PIR inputs. When activated, the module will automatically slew to a pre-determined point, issue an RS232 format alarm signal and operate up to 2 on-board relays.

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## **Connections**

### Power

Standard 2.1mm connector. Requires 9-12V DC @1A, centre contact positive.

### PC Connection

Standard D-9 serial connection (not nul-modem type). Minimum of 3 connections: incoming signal is on pin 3, outgoing signal is on pin 2 and ground connection on pin 5.

### PIR Connections

Connect one of the **Normally Closed** PIR relay contacts to the +5V common terminal and the other to the relevant PIR connector- remove the corresponding jumper from behind the terminal block. The Module supplies a weak +5V line through the PIR relay and is looking for a break in this line (ie under an alarm condition when the PIR relay opens). **Ensure that jumpers are in place when PIRs are not connected or the module will think it is continuously in alarm mode- and you will not get any sense out of it!**

### Relay Connections

Two relays are provided- they are voltage free contacts and Normally Open with a rating of 30VDC @2A. The relays are energised during alarm conditions (their action is set by the Rxxx command) or under direct control mode by the Cx and Dx commands.

## **Operation**

Connect a serial cable to your PC running Hyperterminal (or similar) and ensure the PC is set for 8-N-1 format, no handshaking at 9600 baud.

Connect a suitable power supply to the module.

### Direct Control (Mode 0)

The module is shipped with a set of default settings and will start up in Mode 0, direct control mode and in the central position.

Ensure you have the "Caps Lock" on and type A50 plus a carriage return (Enter). The module will swing to the new position and return the letter "a" to the PC screen. If "-" is returned, this indicates the module does not recognise the command- check you have "CapsLock" on. If no character is returned, the module has not received any valid information. Re-check your comms settings and that you included a carriage return after typing the A50.

### Stepping Mode (Mode 1)

Once you have established good communications, change to Mode1 by typing M1 followed by a carriage return (ie M1 CR).

The module will now be in stepping mode- stepping sequentially through a pre-set number of nodes and waiting a specific time at each node.

The number of nodes, the position associated with each node and the speed may all be set at any time by entering commands as listed in the command summary sheet.

To change the position of a particular node: eg node 6

Type M0 CR - return to direct control mode

Type G6 CR - the module swings to the stored position 6 and returns the pan and tilt values stored for this location.  
Type A75 CR -the pan servo changes to the new position  
Type B50 CR - the tilt servo moves to the new position  
Type P6 CR - the current position is allocated to node 6

The new sequence may be viewed by re-entering Stepping mode (Mode 1)

#### Slewing Mode (Mode 2)

Typing M0 CR will return the module to direct command mode or M2 CR will access slewing mode. In slewing mode the servos will continuously pan (and tilt) between stored end values. The end values and pan and tilt speeds may all be individually set.

#### PIR Operation

If PIRs are connected, then when an alarm condition is detected, the module will automatically move to the stored position allocated to that particular alarm event and output the text Ax (where x is 1 to 4) continuously via the serial link until the alarm condition is cleared. The module waits a set time after the alarm has cleared before proceeding with what it was doing before the alarm was received- this period is set by the Wxxx command.

During an alarm condition, the relays may be configured to operate or not depending on the value stored with the Rxxx command.

#### Start-Up

Once set, the Operating Mode is preserved during power down so that the module may be programmed to Modes 1 or 2 whilst attached to a PC, powered-down and then run independently of the PC.

#### **Notes on Servos**

The servos included with this item are designed for light, intermittent usage. They use standard carbon track position feedback potentiometers which should give approximately 20-25,000 cycles. If you wish to use the module in a more serious/commercial application, then alternative servos will be needed.

## Pan and Tilt Instruction Set

All commands are in ASCII and are terminated by a carriage return.

Ensure comms are set to 8-N-1 format at 9600 baud. No handshaking

Format is <A><1><2><3><CR> - would send the pan servo to position 123

Non alphanumeric characters (eg spaces) are ignored so may or may not be inserted as you wish.

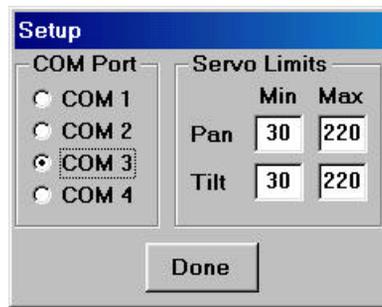
Commands are always terminated by carriage return.

### Commands

Axxx	Move the pan servo to position xxx
Bxxx	Move the tilt servo to position xxx
Cx	Switch relay on or off: C1- on, C0 - off
Dx	Switch relay on or off: D1- on, D0 - off
E	Set current position as start-up position
Gxx	Go to stored set point node number xx (0 to 12) G0 is the start-up position G1-G8 are the nodes during stepping motion G9-G12 are the alarm node positions Module returns the stored pan and tilt values for this position.
Lx	Set current position as the end point during slewing mode L0 saves current position as minimum L1 saves current position as maximum
Mx	Mode select command: M0 Direct control M1 Stepping Action M2 Sweeping Action Module starts up in last saved mode
Nx	Set the number of stepping nodes- maximum of 8 nodes
Px	Store current position as Node X settings for stepping mode
Rx	Relay format byte setting PIR4                  PIR3                  PIR2                  PIR1 Relay2 , Relay1 , Relay2 , Relay1 , Relay2 , Relay1 , Relay2 , Relay1  Bit7 , Bit6 , Bit5 , Bit4 , Bit3 , Bit2 , Bit1 , Bit0  A "1" in the bit position would mean that relay is on when that PIR is active-  eg     %10000100 (132) Relay2 would energise if PIR4 was active Relay 1 would energise if PIR2 was active
Sxxx	Set the pan servo slewing speed (range 1 to 255)
Tx	Store the current position as the Alarm position for PIR X T1 Device moves to current position when PIR1 Active (open circuit) T2 Device moves to current position when PIR2 active etc
Uxxx	Set the tilt servo slewing speed (range 1 to 255)
Wxxx	Set the dwell period in stepping/alarm mode (0 to 255)

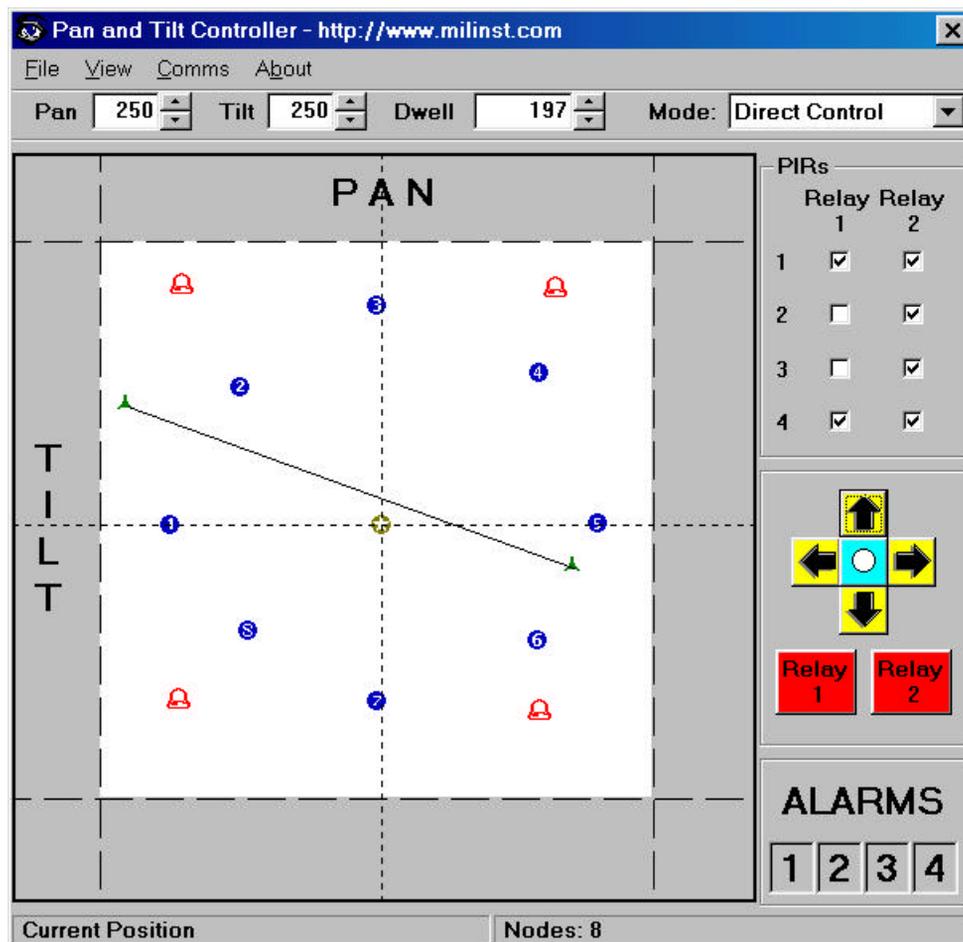
## Front-End Software

The Pan and Tilt Module can also be controlled by the front-end software supplied by Milford Instruments. [www.milinst.com](http://www.milinst.com). When this is run for the first time, you will be presented with the Setup screen.



From here, you set which COM port the Pan and Tilt Module is connected to. Also, depending on the servos you are using, you may wish to set the maximum and minimum values for them. These settings will not restrict the values that are sent to the Pan and Tilt Module, but will indicate the limits on the control screen. After you have set-up the software for the first time, you will not be presented with this screen again, unless you select Setup from the File menu.

Clicking Done will open the Main Window:



This screen is hopefully self-explanatory, but there are a few points which may not be immediately obvious. Starting at the top:  
The boxes marked Pan and Tilt set the speed at which the Module pans and tilts ( 0- stopped, 255- fastest).  
The Dwell box dictates how long the module remains at a node while in stepping or alarm mode.  
These three boxes take a number from 0 to 255  
The final box controls which mode the module is in. All controls are disabled, unless the module is in Mode 0 (Direct Control)

When the window opens, it contacts the module to see if its connected, and if it finds it, it establishes communications by reading its memory and sending it to its home position (node 0).  
The positions of the stepping nodes are marked on the display by their number.  
Node 0 (Home) is marked by 🏠 and the Alarm nodes are marked by bells. By hovering the pointer over the alarm nodes, you can see which PIR/Alarm number they refer to.  
By clicking a node, you can send the module to that node. By dragging the node, you can move the module. By dropping a node, you set its new position. Whilst dragging a node, the current position is displayed on the status bar.  
The line with ^ at each end marks the limits of the module when it is put into sweep mode.

The relays' responses to the PIRs can be set by clicking the appropriate checkboxes in the PIRs frame.

The Arrows can be used to move the module. Just click and hold to move it. The central button sends the module to the position (127,127).  
NB this is not necessarily the starting position (node 0).

The relays can be switched on and off with the buttons below the arrows.

Below the relay buttons are the alarm indicators. When the program receives a message from the Module that a PIR has been tripped, the relevant number goes red and the node marker in the main area turns pink. The relevant relay button (if they are set to switch) also switches.

The dotted lines surrounding the white square indicate the limits set on the setup screen. There are also lines indicating the midpoints for the Pan and Tilt Servos.

You can Save and Load module setups as well using the appropriate commands in the File menu. When you load a setup, the module will move for a brief period as the various node locations are loaded into its memory.

#### **Note for Setup**

If you set the COM port to 1, and your mouse is on this COM port, you may find that the program ceases to run. If this happens, go into the Pan and Tilt directory, delete the SETUP.RES file and re-run the programme selecting the correct (unused) COM port. This will solve your problem!