

This document describes the Super Magic program that is used to program Magic timers for Free Flight model airplanes.

Super Magic 5.0

And the Magic cable

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Table of Contents

1. Introduction	1
2. Program Structure.....	2
2.1. How Super Magic is connected to the timer.	3
2.2. Flight Program Format	3
3. A look at the screens- Start Screen	5
3.1. Setting the timer	6
3.2. Deleting Files.....	7
3.3. Export/Import/Print.....	8
4. Modify Step Times - Times.....	9
4.1. Time by step.....	9
4.2. Cumulative Time View	11
5. Start and Hook	13
6. Servo	15
7. General parameters	16
8. Fixed Timer data	18
9. USB to Serial Cable	20
10. Appendices.....	21
10.1. PC Install.....	21
10.2. JSON file format.	22
10.2.1. Magic Number	22
10.2.2. Sample JSON File.....	22
10.3. Validation	27
10.4. Miscellaneous Tech Information about Super Magic	28
10.4.1. Log files	28

1. Introduction

The version is a major upgrade of the Super Magic program used to configure the Magic family of electronic times for free flight model airplanes. This upgrade consists of several parts, besides the “Main Program” that replaces the Super Magic program on the Palm Pilot there are a number of other important

components that help in the programming of Magic Timer and even offer alternate ways of programming them.

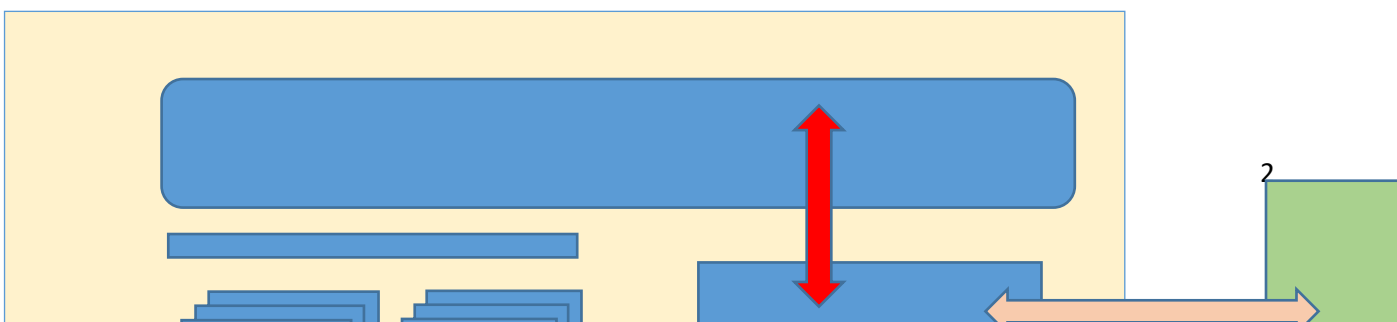
Versions of Super Magic prior to 5.0 ran on the Palm platform. From 5.0 Super Magic has the potential to run on Android, IOS, Windows, MAC OS and some Linux platforms... The software will not be made available on all platforms initially and the release schedule will depend on the demand and available resources.

We have been running Super Magic on the Palm platform for 20 years and during that time have made a number of improvements. There were of course an additional number of improvements that we wanted to do or our customers requested that was not possible with the Palm. Our primary objective to have a way of easily programming our family of Magic Timers for Free Flight model airplanes. Most of our timers are intended for FAI class models that need many functions and options. The potential complexity of these options require an external programming device to set up the timer correctly without making an error. Super Magic does this and is intended for use by the typical FAI Free Flight sportsman rather than the computer geek. Super Magic 5.0 is designed to be installed on the computer, tablet or phone. In addition we have asked over the years to provide an external way of accessing Magic program files. This is not intended for the typical sportsman but rather for the super computer literate type who might want to develop his own processes for working on his Magic Flight programs. There is an additional benefit from this in that program files can be easily sent by email from one user to another.

The old Super Magic comprised one program that both maintained the flight program and transferred it to the timer. The new Super Magic comprises two programs, one maintains the flight program and the other transfers it to the timer. The user only sees one program but there is the ability to have more than one that connects to different types of timer by different ways. For example there can be a way of connecting via a USB connection or a wireless connection that uses Bluetooth...

Up to this point Magic Timers have programmed by a particular type of serial connection that was supported by most of the Palm Pilot models. This type of connection is ono-existent these days in modern computing devices. Our programming solution going forward had to support most of the existing timers as well new types of timer not yet released. This support of existing timers is being done by providing special Magic Cable that has a USB connection on one end and a connection to existing timers on the other. This will interface with the existing range of Magic Timers. It may not be required in the future for new models of Magic Timers with different types of programming connection. This special cable is an "intelligent" cable incorporating a micro controller that does some data and communications medium conversion.

2. Program Structure



The main Super Magic program is used to create and modify the Flight Program for the Magic timer. This program stores the programs in a multi-file database. There is separate file for each flight program. These are all stored in a special file folder (directory).

2.1. How Super Magic is connected to the timer.

The new Super Magic program is designed to work with both the existing timers in the Magic Timer and new timers that will be available in the future. Also the Super Magic program is designed to run on a wide variety of computer, tablets and smart phones, although all versions will not be available at the outset. These different kinds of computer have different ways of connecting to external devices like the Magic Timer. Up to this point the current Magic Timer range connects via a serial connection. This is how it is done with the Palm Pilot. Most modern devices do not provide a suitable serial connection so to get around this a special Magic Cable is provided. This cable has one end that plug into the timer and the other connects to the computing device with a USB connection. USB connections have replaced serial connections on most modern computing devices. It is planned that there will be a version of the Magic Cable with a Bluetooth wireless connection.

Questions have been asked if we will provide timers with a Bluetooth or other form Wireless connection in the timer. That is indeed possible as the system architecture has been constructed to use Bluetooth or similar wireless protocol to go to both or either the computing devices and /or the timer.

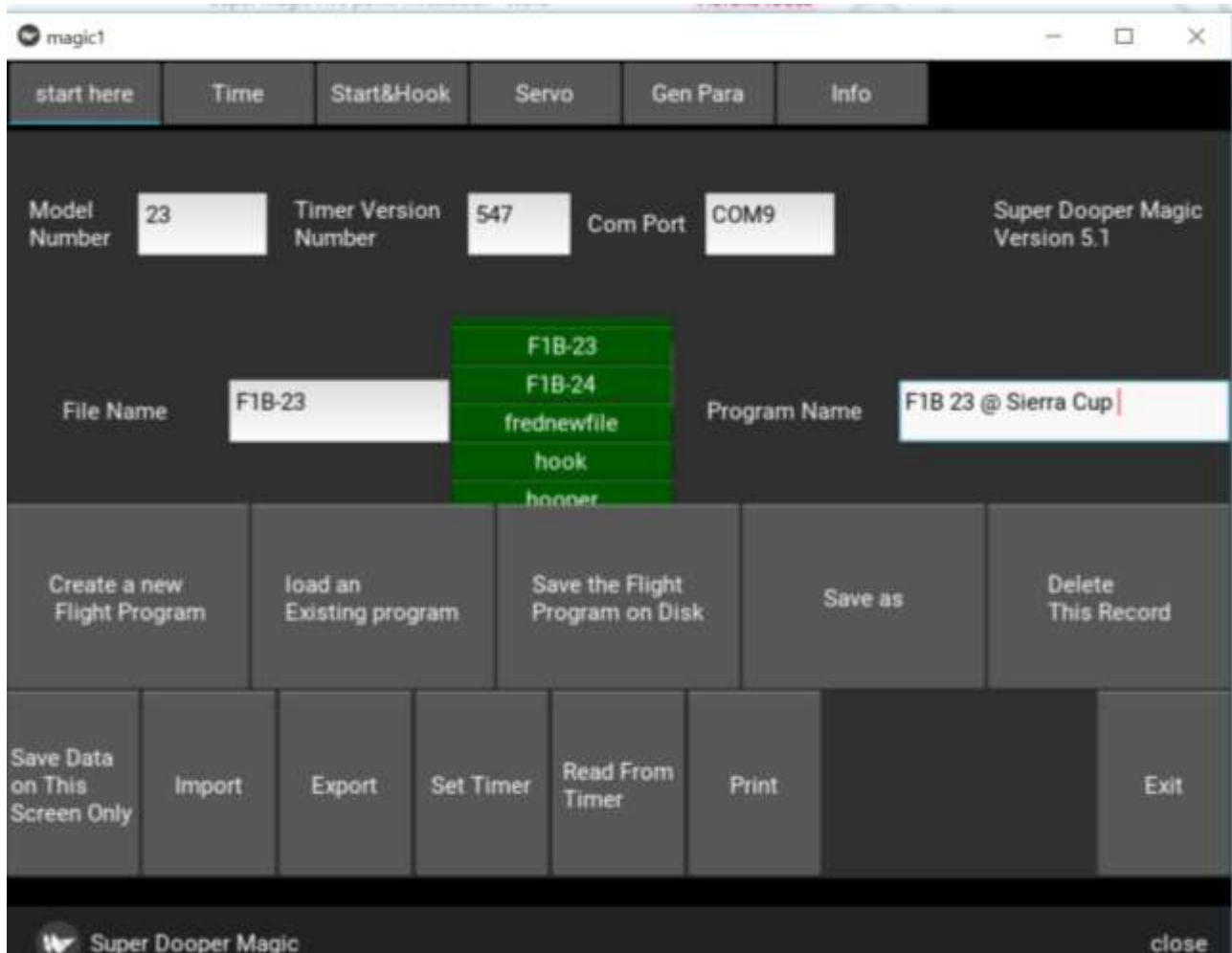
2.2. Flight Program Format

With the current Palm Platform the flight program is stored in a proprietary format that can only be processed by Super Magic on the Palm Pilot. With Super Magic 5.0 each program is stored in an externally accessible and readable file in a designated file folder. The most immediate advantages are that it is possible to back this up these files using any appropriate back up or file copy process on the computing device and it is possible to share this program with another person by email or some other file transfer process. The file is an IT industry standard format called JSON and format of this file will be explained. This means that if the sportsman so desires he would be able to create or modify the file outside the Super Magic process. This is not intended for the typical sportsman but some sportsmen who are also IT experts have asked for this capability.

These files can be exported to and imported from other folders on the PC, tablet or mobile. This enables flight programs to be shared with other sportsmen.

3. A look at the screens- Start Screen

This is where you start off using Super Magic. It lets you select the program from one you stored or read one from the timer. Across the top of the screen are a string of tabs that enable the selection the various Super Magic functions.



This is the start screen. It lets you:

Open an existing flight program

Create a new flight program

Import and export a flight program

Print a flight program

Save a flight program after you have changed it

Read a program from a timer

Program a timer

When you want to load an existing program and tap on the **Load an existing program Button** a list of the stored flight programs will be shown in the green scrolling window and tapping on one will select it and load it.

The **Create a new flight program Button** initializes the work area with default values that you build upon. In both cases you might need to go to different screens to work on different parts of the flight program. On each screen there is a save button on the screen that saves the changes you have done and in some cases performs additional data validation. To save the program permanently to disk you always return to this screen and tap on the **Save this program to Disk Button**.

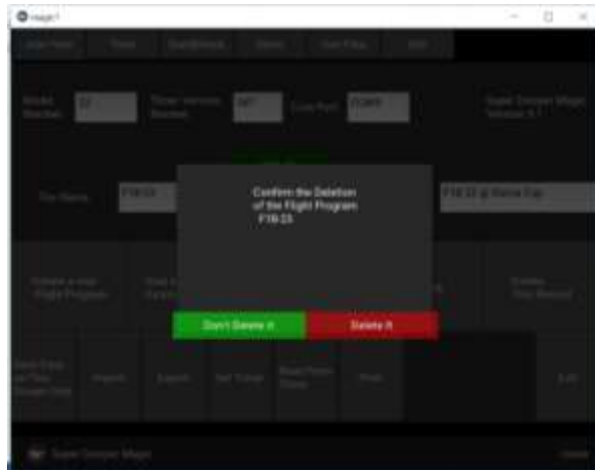
When you enter data it is validated and if you make a mistake a RED error message appear in the bottom right of the screen. From time to time various information and confirmation messages will appear in the same area. These messages are in GREEN

3.1. Setting the timer

Super Magic sets the timer from the flight program that you are currently working on. You can see the program and its details on the screen. Typically to modify the current settings in a timer, you read the program from the timer with the **Read Timer** Button, then make the changes, optionally save the program and then use the **Set Timer** Button to put the revised flight program back in the timer.

3.2. Deleting Files

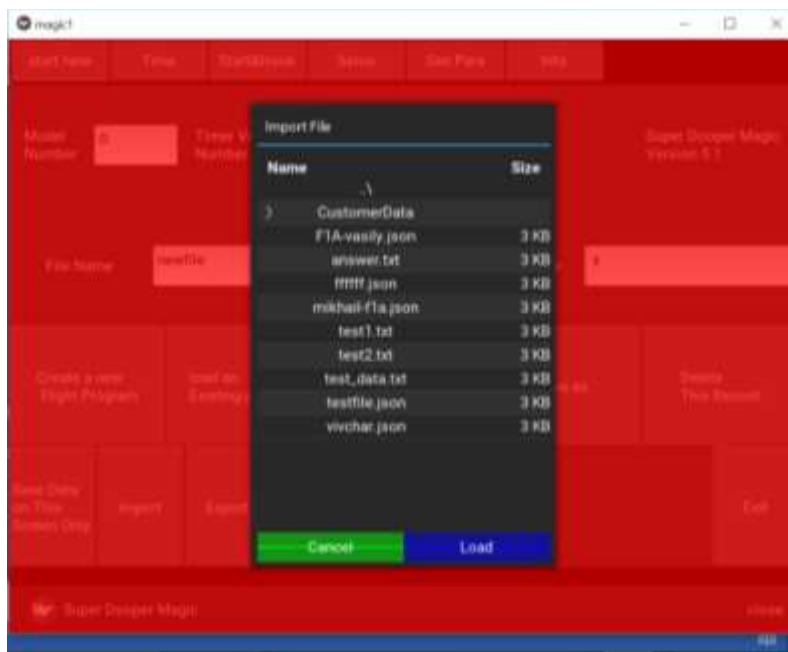
To delete a program from the Super Magic program store, load the program then tap the Delete button and you will get a confirm screen like the one below asking you confirm the deletion.



3.3. Export/Import/Print

Actions involving Import and Export will bring up a dialog to select the file to import or name and directory for the exported file. The items with a > are a directory or folder that may be opened. In the case of import as shown in the screen shot below, high light the file to be imported and tap the load button.

Imported file will be in the JSON format. See section 10 for information about JSON.



If you send to email information to Magic Timers or another supplier about how your timer is configured you should export the program and sent them the JSON file as an email attachment. You can do the same if you are helping a friend who has a similar airplane and Magic Timer and you want to show them how your airplane is set up. You can use the Import button on this screen to import a Magic Timer flight program that is in JSON format that someone has sent you.

You can also “print” the information about your flight program. This formats the information in slightly more compact format and stores the output text file in the outputp directory under the Supermagic directory. This can be printed or emailed.

4. Modify Step Times - Times

Associated with each step in the Magic timer there is an elapsed time for that step and where the servo or servos should be positioned. In addition there are 3 timer 'steps' that are used before the flight really begins. These are called the Hook Forward/Start, Circle Tow/ Armed and Launch/Go. The first term is the F1A term and second the F1B. These are servo positions before the start of the flight

Position	F1A	F1B
Start/Hook Forward	Tow hook is in forward position	Timer is turned on
Circle tow/Armed	Tow hook is back	Start button is pressed
Launch/Go	Hook is forward and unlatched	Start button is released- Flight time starts
	Hook is back – Flight time starts	

4.1. Time by step

The screenshot shows the 'magic1' software window with a table of timer steps. The table has columns for 'Timer Step', 'Time' (Min, Seconds, 1/100), 'action' (J, S, DT), and servo positions (Servo1, Servo2, Servo3, Servo4). The first three steps are 'Start', 'Armed', and 'Go > Action v'. The first 10 steps are listed in the table.

Timer Step	Time Min	Time Seconds	Time 1/100	action	Servo1	Servo2	Servo3	Servo4
Start				J S DT	5	10	20	30
Armed				J S DT	5	10	20	30
Go > Action v				J S DT	6	11	21	31
1	0	1	20	J S DT	0	20	30	40
2	0	3	20	J S DT	0	20	30	40
3	0	2	0	J S DT	10	0	30	40
4	12	4	20	J S DT	10	20	0	40
5	4	5	5	J S DT	2	20	30	40
6	9	6	15	J S DT	2	20	30	0
7	0	1	20	J S DT	2	20	30	40
8	9	7	20	J S DT	2	0	30	40
9	9	17	60	J S DT	10	20	30	40
10	0	0	20	J S DT	10	20	30	40

Buttons at the bottom: save this data, Switch Display, Exit.

This program lets you set the times and servos position for the flight program

The first 3 lines concern the servo positions before the flight starts

The remaining are the 10 steps of the flight program

The servo positions for up to 4 servos are shown on the right of the screen

The time is shown on the right hand side of the screen.

There are two different time displays, this one in Minutes, seconds and 1/100 of a second

When using this screen you change the settings and press the save button to keep the new settings. The program will still have to be written to permanent storage on the start screen

Pushing the Button Switch Display causes

Label	Meaning/use	value
Min	Time- minutes of step	0-29
Seconds	Time – seconds of step	0-59
1/100 sec	Time 1/100 sec of step	0-99
Action	How to move servo	Jump/Step/DT
Servo 1	Where to move servo 1 at end of time	Servo Position
Servo 2	Where to move servo 2 at end of time	Servo Position
Servo 3	Where to move servo 3 at end of time	Servo Position
Servo 4	Where to move servo 4 at end of time	Servo Position

4.2. Cumulative Time View

The screenshot shows a software window titled 'magic1' with a menu bar containing 'start here', 'Time', 'Start&Hook', 'Servo', and 'Gen Para'. The 'Time' menu is selected, displaying a table with 10 steps. The table columns are: Timer Step, Time (with sub-columns Min, Seconds, 1/100), action (with sub-columns J, S, DT), and Servo1 through Servo4. The 'Time' column is labeled 'Time cumulative until D/T'. The 'action' column has a 'Go > Action v' label. The 'Servo' columns show values for each step. At the bottom, there are buttons for 'save this data', 'Switch Display', and 'Exit'. A footer bar contains the 'Super Dooper Magic' logo and a 'close' button.

Timer Step	Time cumulative until D/T			action			Servo1	Servo2	Servo3	Servo4
	Min	Seconds	1/100	J	S	DT				
	-*-									
							5	10	20	30
							5	10	20	30
							6	11	21	31
1	-*-	1	20	J	S	DT	0	20	30	40
2	-*-	4	40	J	S	DT	0	20	30	40
3	-*-	6	40	J	S	DT	10	0	30	40
4	-*-	730	60	J	S	DT	10	20	0	40
5	-*-	975	65	J	S	DT	2	20	30	40
6	-*-	1521	80	J	S	DT	2	20	30	0
7	-*-	1	20	J	S	DT	2	20	30	40
8	-*-	548	40	J	S	DT	2	0	30	40
9	-*-	557	60	J	S	DT	10	20	30	40
10	-*-	557	80	J	S	DT	10	20	30	40

This display shows the same program as the previous screen but the times are in the cumulative format. Note in this format no minutes are shown and the minutes column is marked with -*- and there is a time cumulative label. You use the switch button to go between this and previous screen.

Note that this display assumes the steps are executed sequentially. Actions such as RDT and Energy Limiter input can change the input of steps and potentially the flight time.

Label	Meaning/use	value
Min	Not used	-
Seconds	Time – cumulative seconds	

1/100 sec	Time cumulative 1/100 sec	0-99
Action	How to move servo	Jump/Step/DT
Servo 1	Where to move servo 1 at end of time	Servo Position
Servo 2	Where to move servo 2 at end of time	Servo Position
Servo 3	Where to move servo 3 at end of time	Servo Position
Servo 4	Where to move servo 4 at end of time	Servo Position

5. Start and Hook

The screenshot shows the 'magic1' software window with the 'Start&Hook' tab selected. The interface includes the following elements:

- Navigation Tabs:** start here, Time, **Start&Hook**, Servo, Gen Para.
- Parameters and Controls:**
 - F1A Hook Tow Timeout: 60
 - F1A Bunt Timeout: 5
 - Hook Servo: OFF
 - Gust Bounce: 2
 - Electronic Hook: OFF
 - Impulse Hook: OFF
 - F1B Q Enable: ON
 - save this data: button
 - system message: text area
 - Tow Flyaway Step: a (marked with a red error indicator)
 - Bunt Timeout Step: 4
 - Hook Open: 200
 - Accel Delay: 0
 - Tension Open: 4000
 - OLA Delay: 22
 - OLA Servo 1: 0
 - Live Hook Start Button: ON
 - Red unlatch: OFF
 - Hook Close: 10
 - Accel Period: 0
 - Tension Close: 3999
 - OLA Servo 2: 0
 - OLA Servo 3: 0
 - OLA Servo 4: 0
 - F1Q Start: ON
 - Exit: button
- Footer:** Super Dooper Magic logo, Must be Numeric (red text), close button.

This screen show the parameters concerned with the start of the flight. It has parameters about the hook for a F1A or F1H glider and the start button for a F1B type of model and parameters special for the F1Q Class of electric powered model

This screen also shows and example of the detection of a data entry error. The person has entered the letter a in the tow fly away step. This is marked in red and there is an error message down at the bottom right that says the field must be numeric.

Screen Label	Internal Label	Use/Meaning	value
Tow Hook Timeout		Flyaway Timeout delay without forward hook movement.	Seconds <255
Tow Hook flyaway step		Step to be executed if flyaway timeout is exceeded	step

Live Hook/Start Button		Enables setting D/T without Smart Magic	
Bunt Timeout		On models with simple tow hook. Timeout after hook is forward and hook unlatched before hook goes backward (meaning launch)	seconds
Bunt Timeout		On models with relatchable hook. Time delay to close hook after the signal has been received to close the open hook. This is to give time for the tow line to fall off the	1/10 second
Bunt Timeout Step			step
Red Unlatch		Reverse Unlatch sensor	On/Off
Hook Servo		Enable Hook servo processing	On/Off
Hook Servo Open		Position of hook servo when hook is open	Servo position
Hook Servo Closed		Position of hook servo when hook is closed	Servo Position
Gust Bounce		Gust bounce is the time the hook open has to be signaled before the hook actually opens.	1/10 second
Accel Delay		This is the delay before the stabilizer moves from the hook forward position to the launch position when hook unlatch is detected	1/10 second
Accel Period		This is the delay it takes for the stabilizer to move from the hook forward position to the hook launch position. The movement of the stabilizer linear. This time starts after the Accel Delay is passed.	1/10 second
Hook & Start Bounce		Debounce factor on Hook and Start Button switches.	< 15 use 12
Electronic Hook		Enables strain gauge hook processing	On/Off
Tension Open			On/Off
Tension Close			
Impulse Hook		Enable Impulse hook function	On/Off
OLA Delay		This is the delay between when OLA is signaled and when the servos move to the OLA position	1/10 second < 255
OLA Servo 1		Position of servo 1 when OLA is signaled.	Servo Position
OLA Servo 2		Position of servo 2 when OLA is signaled.	Servo Position
OLA Servo 3		Position of servo 3 when OLA is signaled.	Servo Position
OLA Servo 4		Position of servo 4 when OLA is signaled.	Servo Position
Q Enable			On/Off
F1Q Start			On/Off

6. Servo

This screen holds the servo parameters

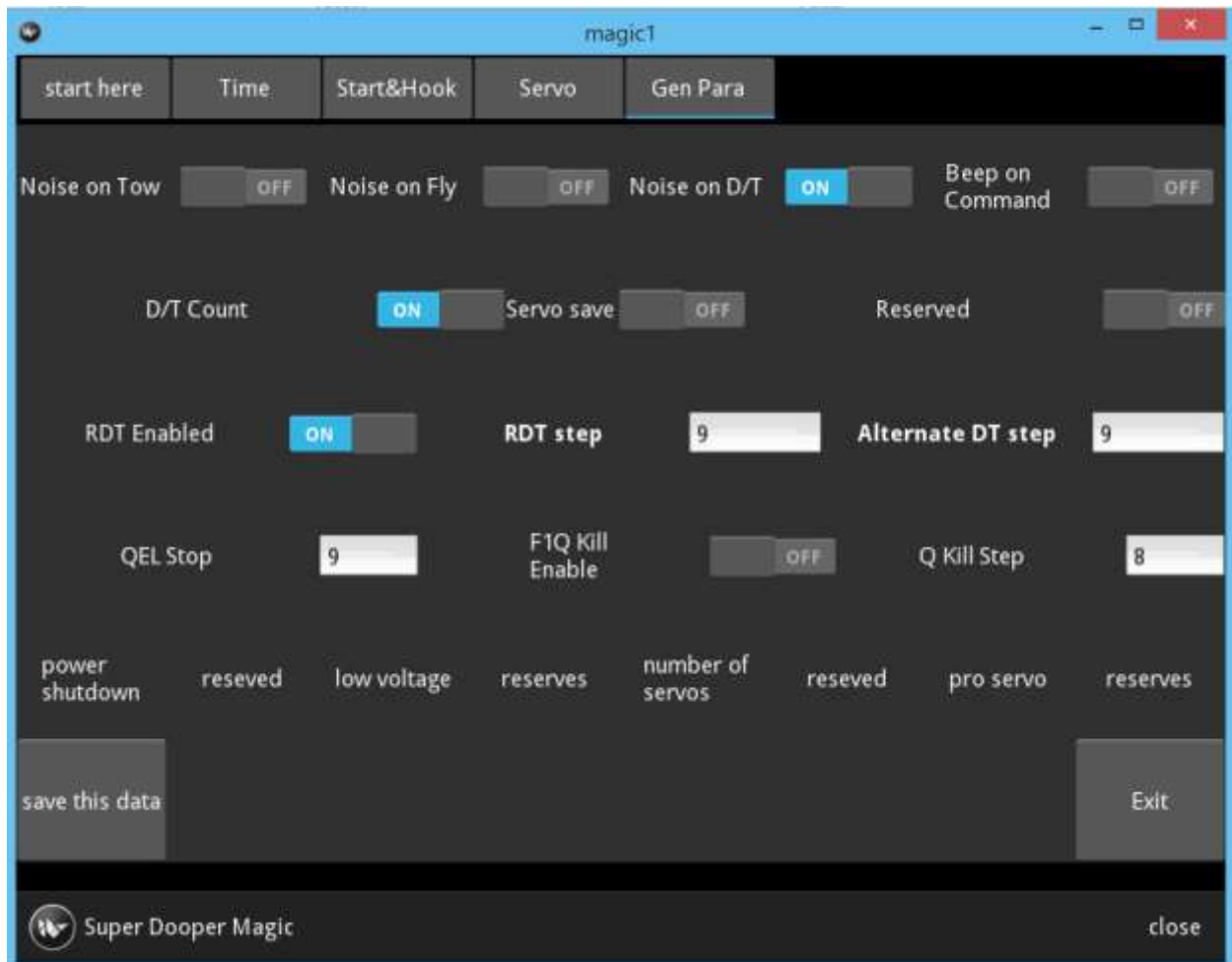
Configure Servo\Settings	Servo1	Servo2	Servo3	Servo4
Base Point	18	18	18	18
Multiplier	5	5	5	5
Speed	1	1	1	1
Reverse	ON	ON	OFF	OFF
Park	0	0	0	0
Screen Label	Servo1	Servo2	Servo3	Servo4

Buttons: Save this Servo Data, Exit

Footer: Super Dooper Magic, close

Screen Label	Use/Meaning	Value
Base Point	Position of low end of servo travel	16-21
Multiplier	Amount of servo travel Single digit apply to 1 and 2 servo timers, 3 digits to Pro Level timers, those with 3 or more servos.	3-7 (350-700) use 4-5(400-500)
Speed	Frequency of servo refresh – not used	1
Reverse	Make servo rotate in the opposite sense	On/Off
Park	Position after D/T	Servo position (0-255)
Screen Label	Label used on Time screen – First character saved on timer	

7. General parameters

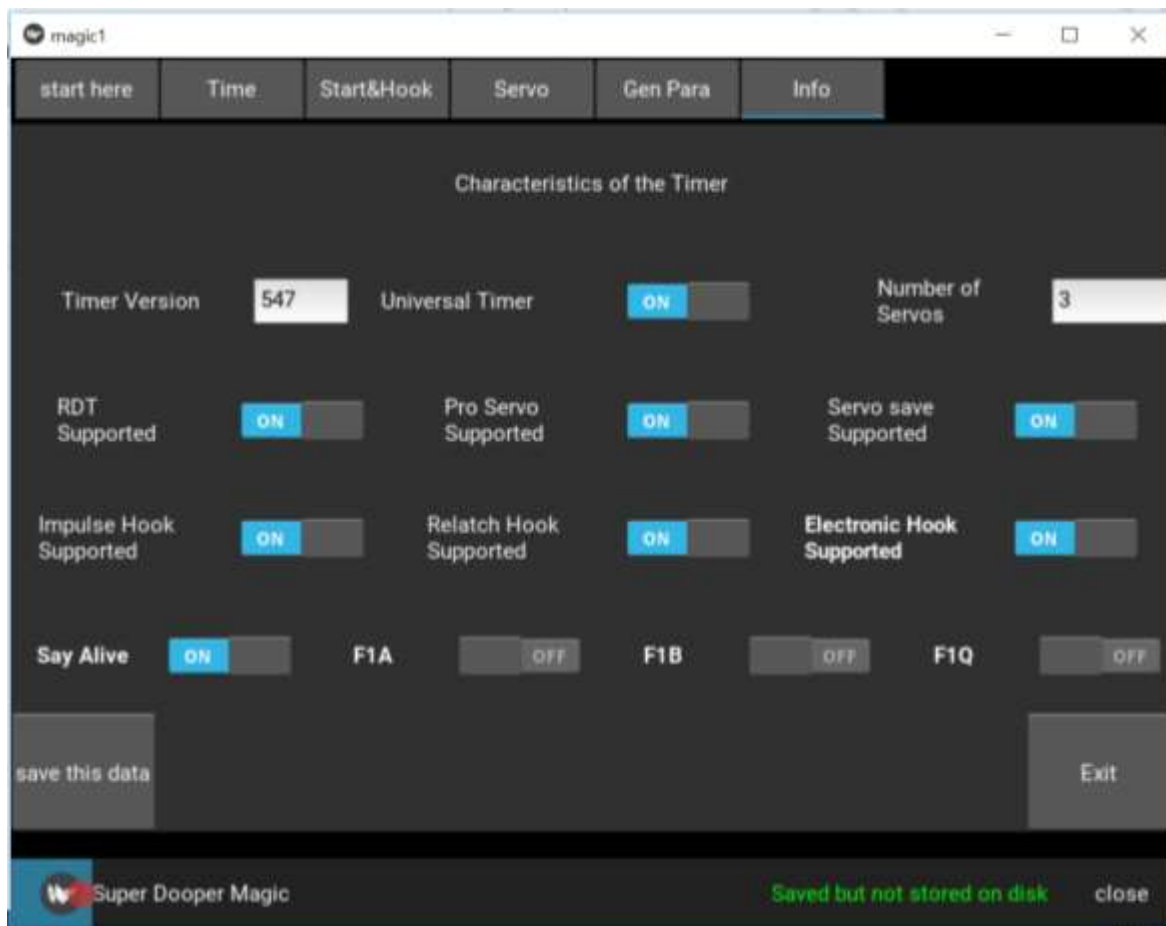


Screen Label	Internal Label	Meaning or Use	Value
Noise on Tow		Beeper beeps once a second before launch, i.e. while model is on tow	On/Off
Noise on Fly		Beeper beeps once flight has started	On/Off
Noise on D/T		Beeper beeps once a second after D/T	On/Off
Beep On Command		Beeper beeps when RDT is pushed after D/T, 15 times	On/Off
D/T Count		Model Beeps length of D/T at power up or reset	On/Off
Servo Save		Servo save is enabled. Servo turned off "when not in use"	On/Off
RDT Enabled		RDT is enabled on timer	On/Off
RDT Step		Timer step that is executed when RDT signal received	step
Alt DT		Timer step executed for D/T od Alt D/T switch on	step
QEL Stop		Step executed when F1Q Energy Limiter Signal received	On/Off

F1Q Kill Enabled		F1Q emergency motor stop enabled	On/Off
F1Q Kill Step		Timer step executed if F1Q stop executed	step

8. Fixed Timer data

Each timer has fixed data that is built in to the timer and describes the characteristics of the timer. One example of this is the number of servos that the timer supports. When connect Super Magic to the timer either to read the flight program or to set the flight program this fixed data is sent from the timer to Super Magic and is displayed on the Timer Characteristics screen as seen below.



Screen Label	Internal Label	Use or meaning
Timer version		Version number of timer firmware
Universal Timer		Timer does both F1A and F1B
Number of servos		Number of servos including flight and hook
RDT Supported		RDT Supported
Pro Servo Supported		Servo Multiplier has 2 decimal places
Servo Save Supported		Servo save means servo can be turned off
Impulse Hook Supported		F!A timer can support M&K Impulse Hook
Relatch Hook Supported		Timer can support Hook Servo
Electronic Hook Supported		Timer can support hook with strain gage
Say Alive		Timer has say alive beep and/or blink
F1A		F1A Timer

F1B		F1B Timer
F1Q		F1Q Timer
Alt D/T Supported		Timer has Alt D/T switch

9. USB to Serial Cable

This is a custom cable aka Magic Cable that replaces the old serial cable that was used with Palm Pilot versions of Super Magic. It connects a USB serial port with the special kind of serial connection used in many Magic Timers. Embedded in the cable is a microcontroller that assists with the conversion of both the data and the method of connection. This connection cannot be made with a generic USB to serial connector. Note that it is not possible to use a 'normal' USB to serial cable

Using the Windows Device Manager to look at the ports you will see CCS USB to UART (COMXX) where COMXX is the COM Port number. This COM Port may need to be entered on the Start screen. If you need to do this don't forget to push on the Save this screen button to save the value before trying to use it.

The initial default value can be save in the magic1.ini file in the /users/you/documents/supermagic or /users/you/.kivy directory depending on your particular configuration and looks like

magic1.ini

```
[communications]
com_port = COM6
```

To support this connection on a Windows PC a USB CDC serial driver maybe required. This is provided as part of the Super Magic 5.0 package.

10. Appendices

10.1. PC Install

The install procedure for the initial releases of Super Magic 5.0 is very simple.

The distribution is a ZIP file that creates a Supermagic folder/directory. Use this to create a supermagic directory in your Documents directory. In that directory there is a supermagic .exe. This is the program to run so just double click on it.

In the initial releases for Super Magic a Windows Command Window will open underneath the Super Magic window. This shows progress and diagnostic information. This window can be ignored. It will be disabled in future release of Super Magic

10.2. JSON file format.

This page shows what the internal files holding the flight programs look like. There is no need to understand this in any details for normal operation. It is assumed that users of Magic Timers will use the Super Magic program to maintain their flight programs. Modifying the program file by other means can lead to unexpected results. Changing the values of one of the parameters to a value not permitted by Super Magic will not cause the desired effect with the timer, unless the desired effect is a random and unexpected result. An unexpected value may be silently ignored. Manual changes to your flight program files are not supported by Magic Timer Customer Support.

There might be times when you want to send information about your timer to Magic Timers, you do this by exporting the flight program. It will create a JSON type of file that can be emailed. You can also import a JSON type of file that Magic Timers or a friend might send to you,

10.2.1. Magic Number

In looking at the flight program JSON file it is easy to see a relationship between most of the flight program parameters and the JSON file's values. There is one parameter called the Magic Timer and it has a value of 1840. This parameter is what is known in some systems as a magic number. It indicates that the file is a bone fide flight parameter file, not just a file that may be named like a flight program but really one from some other source. Super Magic will give warning on number missing or in error.

10.2.2. Sample JSON File

A sample JSON file is shown below. This file shows what a JSON file looks like. It is not the definition of what the definitive JSON file for Super Magic looks like. The listing of the file is shown in 2 columns, this is just to save space on the page.

```
{  
  "Accel Delay": 0,  
  "Accel Period": 0,  
  "Alt DT Step": 9,  
  "Beep On Command": false,  
  "Bunt Step": 4,  
  "Bunt Timeout": 5,  
  "D/T Count": true,  
  "EL Step": 2,  
  "Extension Hook": false,  
  "FlB Mode": false,
```

```

"File Name": "imported.json",
"Flyaway Step": 5,
"Flyaway Timeout": 60,
"Gust Bounce": 2,
"Hook Bounce": 12,
"Hook Close Position": 10,
"Hook Close Tension": 0,
"Hook Open Position": 200,
"Hook Open Tension": 0,
"Hook Servo": false,
"Impulse Hook": false,
"Live Hook": true,
"Low Voltage": "Reserved",
"Magic Timer": 1840,
"Model Number": 23,
"Noise D/T": false,
"Noise Fly": false,
"Noise Tow": false,
"Number of Servos": 3,
"OLA Delay": 0,
"OLA Servo 1": 0,
"OLA Servo 2": 0,
"OLA Servo 3": 0,
"OLA Servo 4": 0,
"Power Shutdown": "Reserved",
"Pro Servo": true,
"Program Name": "FlB 23 @ Sierra Cup",
"Q Kill": 9,
"Q Kill Enable": false,
"Q Start": false,
"RDT Enabled": true,
"RDT Step": 9,
"Red Unlatch": false,
"Servo-1": [
    18,
    5,
    1,
    false,
    0,
    "Servo1"
],
"Servo-2": [
    18,
    5,
    1,
    false,
    0,
    "Servo2"
],
"Servo-3": [

```



```

        18,
        5,
        1,
        false,
        0,
        "Servo3"
    ],
    "Servo-4": [
        18,
        5,
        1,
        false,
        0,
        "Servo4"
    ],
    "Servo Save": false,
    "Step-1": [
        0,
        0,
        20,
        "J",
        10,
        20,
        30,
        40
    ],
    "Step-10": [
        0,
        0,
        20,
        "5",
        10,
        20,
        30,
        40
    ],
    "Step-2": [
        0,
        0,
        20,
        "J",
        10,
        20,
        30,
        40
    ],
    "Step-3": [
        0,
        0,
        20,

```

```
        "J",
        10,
        20,
        30,
        40
    ],
    "Step-4": [
        0,
        0,
        20,
        "J",
        10,
        20,
        30,
        40
    ],
    "Step-5": [
        0,
        0,
        20,
        "J",
        10,
        20,
        30,
        40
    ],
    "Step-6": [
        0,
        0,
        20,
        "D",
        10,
        20,
        30,
        40
    ],
    "Step-7": [
        0,
        0,
        20,
        "J",
        10,
        20,
        30,
        40
    ],
    "Step-8": [
        0,
        0,
        20,
```

```

        "J",
        10,
        20,
        30,
        40
    ],
    "Step-9": [
        0,
        0,
        20,
        "J",
        10,

        20,
        30,
        40
    ],
    "Step-A": [
        5,
        10,
        20,
        30
    ],
    "Step-G": [
        6,
        11,
        21,
        31
    ],
    "Step-S": [
        5,
        10,
        20,
        30
    ],
    ],
    "Timer Version": 2.0
}

```

End of file

10.3. Validation

Servo position: Must be 0-255

Timer Step: Must be 1-10

Hundredths of a second: Must be 0-99

Seconds: on step by step screen must be 0-59. On Cumulative screen must be 0-2000

Minutes: Must be 0-30

Servo Base Point: Must be 13-27

Servo Speed: Must be 0-5

Servo Multiplier: Must be 3 to 7 or 300 to 750

10.4. Miscellaneous Tech Information about Super Magic

Super Magic is written in the programming language Python and uses a User interface library called Kivy. It includes its own copy of a Python interpreter. You will see some log and config files created that have the words python or Kivy in the file's name.

10.4.1. Log files

In the user's home directory under Windows there is a .kivy folder, under this directory there is a logs directory. A log file is created every time you run Super Magic. This log file and some technical information that you may need to send to Magic Timers to trouble shoot a potential problem. It also contains a record of your actions such as when you read and write to a timer.

These log files should be deleted from time to time.