

Tahmid's blog

Microcontroller and Power Electronics

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Wednesday, February 13, 2013

Demystifying The Use of Table Pointer in SPWM - Application in Sine Wave Inverter

I have previously written quite a few articles on sinusoidal pulse width modulation (SPWM). I've discussed about how to generate the sine table, how to implement it, how to practically generate the SPWM signals (with example code) and also how to implement feedback with simple sine table manipulation with table pointer instead of complex PID control. All these methods have one thing in common regarding the implementation - use of the sine table and its control with the table pointer. Whether you use or implement feedback or not, the table pointer is used to access and retrieve values from the sine table.

Before reading or going through this article, I suggest you go through these first:

[Tutorial \(Click here to open tutorial\): Generation and Implementation of Sine Wave Table](#)

[Article \(Click here to open article\): Smart Sine – Software to generate sine table](#)

[Article \(Click here to open article\): Generation of sine wave using SPWM in PIC16F684](#)

It took quite a while for me to understand exactly how the table pointer works in this case – to retrieve data from the sine table and feed it to the PWM module and generate the required output 50Hz frequency (you can use any frequency but my requirement is 50Hz). I had come across the method and its explanation when coding for the dsPIC33 microcontroller while I was attempting to make a sine wave inverter using the dsPIC33. After a lot of research and thinking, I could finally implement it for PIC16.

While many have seen my posted codes and explanations regarding sinusoidal pulse width modulation (SPWM), some people have requested me to explain how the table pointer in the interrupt works. Remembering my difficult experience with this, I decided to write up this article to help all of you who are struggling with this to help clear your doubts and make you understand exactly how it works so that one can implement SPWM with a sine table with any number of table values and for any desired output frequency.

Let's take a look at the code line by line. And I'll explain it all. Keep in mind that the target microcontroller is a PIC16F684 running off an oscillator frequency of 16MHz. So, if you're attempting to "port" the code to any other microcontroller keep in mind that the registers will/may be different from those in the PIC16F684.

```
//-----  
//Programmer: Syed Tahmid Mahbub  
//Target Microcontroller: PIC16F684  
//Compiler: mikroC PRO for PIC (Can easily port to any other compiler)  
//-----  
  
unsigned char sin_table[32]={0,25,49,73,96,118,137,  
159,177,193,208,220,231,239,245,249,250,249,245,  
239,231,220,208,193,177,159,137,118,96,73,49,25};  
  
unsigned int TBL_POINTER_NEW, TBL_POINTER_OLD, TBL_POINTER_SHIFT, SET_FREQ;
```


For the MOSFET drivers, you can use the common high-low side drivers – IR2110. For a thorough tutorial on using the IR2110, check out: [Tutorial \(Click here to open tutorial\): Using the high-low side driver IR2110 – explanation and plenty of example circuits](#)

Another tutorial (this one regarding low side MOSFET drivers):

[Tutorial/Article \(Click here to open tutorial/article\): Low-Side MOSFET Drive Circuits and Techniques – 7 Practical Circuits](#)

Now, back to the software side of things. The registers responsible for the automatic updating of the duty cycle are **SET_FREQ**, **TBL_POINTER_SHIFT**, **TBL_POINTER_NEW**, **TBL_POINTER_OLD** and **DUTY_CYCLE**. So, I'll get to this a little later. Let me deal with the rest first.

Setting ANSEL to 0 selects the ADC-associated pins as digital and this is done since the ADC isn't required for this program, and this frees up the pins multiplexed to the ADC so that they can be used as digital IO lines. Setting CMCON0 to 7 does the same thing, just for the comparator instead of for the ADC.

PORTC bits 0 to 5 are all made input at first. CCP1CON is set to 0x4C. This sets the ECCP mode to "PWM Mode" with P1A, P1B, P1C and P1D set active-high. Timer 2 is turned on and a polling check is done to check if Timer 2 has overflowed or not. When Timer 2 overflows, the interrupt flag is cleared and PORTC bits are selected as output pins. Timer 2 interrupt, global interrupt and peripheral interrupt are enabled.

Now the program just loops in the infinite endless while loop. So, the program now just does nothing – but execute the interrupt when it occurs. Since PR2=249, the time period is 62.5us. I assume you can do the math. So, an interrupt occurs every 62.5us.

Now on to the main part of this code – the interrupt. Every 62.5us the interrupt service routine is "entered" (if you think of it like that in terms of program "flow") and executed.

In the main() function, I had assigned the value of 410 to **SET_FREQ**. **SET_FREQ** determines the output frequency of the sine wave, which in our case here is 50Hz. You'll soon see how.

In the interrupt, the variable **TBL_POINTER_NEW** is updated – every 62.5us it is increased by 410. **TBL_POINTER_NEW** is a 16-bit variable and at the beginning of program execution has a value of 0. So, after the first interrupt it holds 410, after the second interrupt 820, after the third 1230 and so on. After 159 interrupts, **TBL_POINTER_NEW** holds 65190. So, at the next interrupt, **TBL_POINTER_NEW** overflows and holds 64.

The interrupt occurs every 62.5us. At each interrupt **TBL_POINTER_NEW** is increased by 410. At the 160th interrupt, **TBL_POINTER_NEW** overflows, just as it does the 320th interrupt, the 480th interrupt and so on.

Initially **TBL_POINTER_NEW** holds 0 and on subsequent interrupts, **TBL_POINTER_NEW** holds 410, 820, 1230, 1640, 2050, 2460, 2870, 3280, 3690, 4100 and so on.

TBL_POINTER_SHIFT right-shifts **TBL_POINTER_NEW** eleven times and stores that value. Right shifting 11 times is the same as dividing by 2^{11} ($2^{11} = 2048$) – just more efficient. When the microcontroller starts up, **TBL_POINTER_SHIFT** holds 0 and on subsequent interrupts, **TBL_POINTER_SHIFT** holds 0, 0, 0, 0, 1, 1, 1, 1, 1, 2, 2, 2, 2, 3, 3, 3 and so on. Now, the trend is that **TBL_POINTER_SHIFT** holds the same value for 5 consecutive interrupts – go on, you can do the math. Why 5 times? We'll see that a little later.

After **TBL_POINTER_NEW** is shifted 11 times, **DUTY_CYCLE** is assigned the resultant 5-bit value. This acts as – or rather is – the table pointer and the required value is retrieved off the sine table. This value is assigned to CCP1L, thus setting the appropriate duty cycle.

Now let's see why **TBL_POINTER_SHIFT** is needed to be incremented every 5 interrupts and how we've done that.

Our frequency is 50Hz – time period is 20ms. A half cycle takes 10ms. Recall that the sine table used is only for half a cycle. So, the 32 values must be called such that they make up the half cycle. The interrupt service routine is executed each 62.5us and so, retrieving all the values from the sine table and using them to update the duty cycle takes a total time of $62.5\mu s * 32 = 2000\mu s$ (assuming each value is retrieved/called once). That's 2ms. But our half cycle is 10ms – 5 times larger than what we have now. So, we increase the time five folds. How? By calling each value from the table 5 times instead of only once. So, the time involved is now $32 * 62.5\mu s * 5 = 10000\mu s = 10ms$.

This calculation we've just done is related to the frequency – 50Hz desired frequency and thus 10ms half cycle. I've shown this "backward" to explain why this has been chosen but remember that the microcontroller doesn't know you want 50Hz frequency. The microcontroller

doesn't know that the desired time is 10ms.

So, now you know the answer to why I've called each sine table value 5 times: to ensure that the sine table that has 32 values occupies the entire 10ms. Now, how did I make it repeat 5 times? By setting **SET_FREQ** to 410. You might be wondering how this works. Well, it works this way.

SET_FREQ = 410. Each interrupt, **TBL_POINTER_NEW** is increased by 410. Every 5 interrupts, **TBL_POINTER_NEW** is increased by 2050 (compared to the initial value). $2^{11} = 2048$. Since **TBL_POINTER_SHIFT** divides **TBL_POINTER_NEW** by 2048, when **TBL_POINTER_NEW** increases 5*410 times, **TBL_POINTER_SHIFT** increases once. So, the number of repeats (5 in this case) is equal to the number of interrupts it takes for **TBL_POINTER_SHIFT** to increase by one, which is equal to the number of times it takes for **SET_FREQ** to equal or cross 2^{11} (=2048). Since **SET_FREQ** = 410, the number of times to cross 2048 is 5 and that is the number of times each table value is called. So, the table pointer is incremented every 5 interrupts. Thus **SET_FREQ** determines the frequency. If we had set **SET_FREQ** to 200, the number of times to cross 2048 would be 11, as $200 \times 10 = 2000$ (less than 2048) but $200 \times 11 = 2200$ (more than 2048). Thus each sine table value would be called 11 times – the table pointer would be incremented every 11 interrupts. The output time period of the sine wave would then be $2 \times 32 \times 62.5\mu s \times 11 = 44000\mu s = 44ms$. The output frequency would thus be 22.7 Hz instead of the 50Hz we have now.

SET_FREQ can be calculated as $\{65536 / (32 \times 5)\} = 409.6 = 410$ rounded off to the nearest integer. That's $2^{16} / \{(\text{Number of sine table values}) \times (\text{Number of times each value is to be called})\}$.

I've talked about **SET_FREQ**, **TBL_POINTER_NEW**, **TBL_POINTER_SHIFT** and right shifting eleven times. Now you may ask why eleven times. Why not 5 or 10 or 12 or any other value? The reason is that we have a sine table with 32 values. $32 = 2^5$. Shifting a 16-bit variable eleven times to the right leaves us with a 5-bit value – one between 0 and 31. These 5 bits are the upper most (most significant) 5 bits. This 5-bit value is the sine table pointer. This works in conjunction with the number of sine table values and the value of **SET_FREQ** to set or determine the output sine wave frequency. If we had 64 sine table values, we would right-shift **TBL_POINTER_NEW** 10 times instead of 11 so that the shifting operation results in a 6-bit value. $2^6 = 64$ and that is the number of sine table values we have – the table pointer would have a value between 0 and 63.

At the end of this tutorial, I have covered an example. You should follow the example and I'm sure things will be clear by then (I know that the amount of information presented thus far *is* overwhelming and difficult to grasp!).

In the interrupt, after the duty cycle is set, **TBL_POINTER_OLD** is assigned the value of **TBL_POINTER_NEW**. When **TBL_POINTER_NEW** is first assigned 410, **TBL_POINTER_OLD** holds 0. The 11-bit shifting is done. The duty cycle is set and then **TBL_POINTER_OLD** is set. So, the **TBL_POINTER_OLD** update trails **TBL_POINTER_NEW** update. So, every interrupt until **TBL_POINTER_NEW** overflows, **TBL_POINTER_NEW** is greater than **TBL_POINTER_OLD**.

When **TBL_POINTER_NEW** = 64370 and the ISR is to be executed, **TBL_POINTER_OLD** also holds 64370. **TBL_POINTER_NEW** is increased to 64780 and then the sine table value is called and **TBL_POINTER_OLD** is then updated to 64780. The next interrupt, **TBL_POINTER_NEW** is increased to 65190 and the "if condition" is again false since at that stage **TBL_POINTER_OLD** holds 64780 – **TBL_POINTER_NEW** > **TBL_POINTER_OLD**. Then at the end of the ISR, **TBL_POINTER_OLD** is assigned 65190. And now comes the interesting part. **TBL_POINTER_NEW** now holds 65190 and **TBL_POINTER_OLD** holds 65190. 410 is to be added to **TBL_POINTER_OLD** and **TBL_POINTER_OLD** overflows to hold 64. Now, **TBL_POINTER_NEW** (which holds 64) is less than **TBL_POINTER_OLD** (which holds 65190) and the if condition is true and P1M1 bit of CCP1CON is inverted. This inverts the direction of the full-bridge drive. When P1A and P1D were being driven previously, P1B and P1C will now be driven and vice versa. By inverting the direction of the full-bridge drive, we are carrying out the next half cycle with the same duty cycle values and sequence, but in the opposite direction – as is necessary (think AC waveform and opposite half cycle). This happens every $(32 \times 5 = 160)$ interrupts – when all the values of the table have each been called 5 times. Since **TBL_POINTER_OLD** then has a small value again, since it overflowed, **TBL_POINTER_SHIFT** will then be equal to 0, meaning that the table pointer has restarted from zero and the SPWM starts over again. So, **TBL_POINTER_SHIFT**, on subsequent interrupts has the values: 0,0,0,0,1,1,1,1,1,2,2,2,2,3,3,3,3,.....30,30,30,30,30,31,31,31,31,0,0,0,0,1,1,1,1,1,..... And so on.

Now that I've explained how it all works (I have a hunch you haven't fully grasped everything yet), let's see how you can make necessary modifications to suit your purpose (and make sure you grasp it all properly).

Now let's consider a situation where we use 20kHz instead of 16kHz, have 64 sine table values and a sine wave frequency of approximately 30Hz.

We would set the number of shifts to 10 instead of 11 so that the shifting operation results in a six-bit value: $2^6 = 64$, since we have 64 sine table values.

For 20kHz frequency, the time period is 50 μs . $50\mu s \times 64 = 3200\mu s (= 3.2ms)$. Time period for 40Hz is 25ms – half a cycle is thus 12.5ms.

As calculated above, the entire calling of the sine table, if each value is called once, takes a total time of 3.2ms. That's much less than the required 12.5ms and so, each sine table value should be called more than once. Calling each value four times means a total time of 12.8ms, which is close to 12.5ms (the required calculated time). So, each value is to be called four times. The frequency is $(1/(0.0128*2))\text{Hz} = 39.1\text{Hz}$ – slightly off our target 40Hz.

Earlier, I had mentioned:

SET_FREQ = $[2^{16}/\{(\text{Number of sine table values}) * (\text{Number of times each value is to be called})\}]$

So, in this case, it'll be **SET_FREQ** = $[2^{16}/\{64*4\}] = 256$.

Now to verify this.

SET_FREQ = 256. $256 * 3 = 768$ (less than 2^{10}). $256 * 4 = 1024$ (equal to 2^{10}). So, each 4 interrupts, the value of the sine table pointer will increase by 1.

So now we have:

SET_FREQ = 256;

TBL_POINTER_SHIFT = **TBL_POINTER_NEW** >> 10;

And that's it. It's not too difficult once you grab it. The main part of the interrupt is 7 lines only! And it's taken me 6 pages to explain it! And I hope I've helped you understand it clearly so now you can edit my code to your requirement or even write a new code from scratch! Let me know your comments and feedback! Happy coding!

Tahmid at 4:35 PM



214 comments:



Unknown February 15, 2013 at 1:20 AM

Hi im Hema (PG scholar), for my project i am in need of 3 PWM channels.so i chose pic16f777a, but it is not available in proteus software. what shall i do?

Reply


▼ Replies

Anonymous February 15, 2013 at 7:37 PM

please help me .

How i can use this code for pic16f88 ??




Tahmid  February 16, 2013 at 12:54 AM

You can't use this for PIC16F88 because PIC16F88 does not have ECCP module. You will have to make large modifications and do without the ECCP module, relying heavily on software.

Regards,
Tahmid.



Tahmid  February 16, 2013 at 9:06 AM

Hi hema,

If PROTEUS simulation is a must, then you must change your microcontroller since, as you know, PIC16F777A is not available in PROTEUS.

Here are some microcontrollers that are available in PROTEUS and have 3x ECCP modules:

PIC18F6527
PIC18F6622
PIC18F6627
PIC18F6628
PIC18F6722
PIC18F6723
PIC18F8527
PIC18F8622
PIC18F8627
PIC18F8722

These dsPIC33 microcontrollers are available in PROTEUS have Motor Control modules that you can make use of (if you can use dsPIC33, I highly recommend them):


dsPIC33FJ12MC201
dsPIC33FJ12MC202
dsPIC33FJ16MC304
dsPIC33FJ32MC202
dsPIC33FJ32MC204

Hope this helps!

Regards,
Tahmid.

Reply



Tahmid  February 16, 2013 at 9:32 AM

@ Anonymous,

I have written an article regarding the generation of sine wave without ECCP module - using only one CCP module. I have used PIC16F877A which has only CCP modules. Like PIC16F877A, PIC16F88 doesn't have any ECCP module. But PIC16F88 does have a CCP module which you can use to generate the sine wave using my program/method with slight modification as required to port it to PIC16F88.

View the article here:

Sine Wave Generation without ECCP - Using single CCP Module of PIC16F877A
http://tahmidmc.blogspot.com/2013/02/generation-of-sine-wave-without-eccp_16.html

Regards,
Tahmid.

Reply


Anonymous February 16, 2013 at 5:04 PM

thank you very much for your help

Reply

▼ Replies



Tahmid  February 17, 2013 at 4:37 AM

I'm glad to have helped.

I wish you success in your project!

Regards,
Tahmid.

Reply


Anonymous February 19, 2013 at 12:23 AM

Please where did u set the value of PR2 in the code. Aw do I make it work in proteus sim

Reply

▼ Replies



Tahmid  April 22, 2013 at 5:42 AM

I have set PR2 to 249 in the code.

Regards,
Tahmid.

Reply




Onwa1 April 11, 2013 at 5:52 PM

I cant see any PR2 settings in the code and when I run the simulation, I dont see anything on the oscilloscope.

Reply

▼ Replies



Tahmid  April 22, 2013 at 5:44 AM

I have set PR2 to 249 in the code. Check the outputs at PIC pins P1A, P1B, P1C and P1D. Ensure that you have built the program successfully and that you have set the correct configuration settings.

If you upload your Proteus file, I can take a look.

Regards,
Tahmid.

Reply



zvizdic April 25, 2013 at 12:41 PM

Hi Tahmid

If I am corect set frq for 60Hz is 492


All rest is the same

I like to tray make 60Hz inverter

Reply

▼ Replies



Tahmid  April 27, 2013 at 2:16 AM

Yes, that's correct. SET_FREQ = 492 for 60Hz.

Regards,
Tahmid.



april May 16, 2014 at 4:39 AM

hi, tahmid how did it came out 492 for 60hz? whats the formula?



Unknown April 21, 2018 at 3:38 AM

hello sir i want v/hz ratio to be kept constant how can i use this code for controlling speed of 3-phase induction motor?

Reply



zvizdic April 28, 2013 at 8:30 PM


Thanks Tahmid

I like to use PIC16F616 for it suply voltage 2-15v.
If you look at data for the chip you'll see that it has internal oscillator of 4MHz.
Please help

Reply

▼ Replies



Tahmid  May 2, 2013 at 6:07 AM

The supply voltage is up to 5V, not 15V. I'm sure you already know that and it was a typo on your part.

For applications where timing is critical, it is better not to use the internal oscillator. Use an external crystal oscillator or similar. You'll (usually) get better accuracy, precision and lower drift with changing external factors, such as temperature, etc.

Regards,
Tahmid.

Reply




zvizdic April 28, 2013 at 10:09 PM

I am hoping to drive mosfets directly from PIC if posible .
Minimal part count sg3525 to drive ferrite transformer PIC to chop for 60Hz 120V for my windmill project.
Your help is great so far

Reply

▼ Replies

Tahmid  May 2, 2013 at 6:09 AM



Thanks.

Use a driver such as TC427 to drive the MOSFET directly from the PIC.

However, where possible, I recommend using dedicated PWM controllers such as SG3525 as they reduce program complexity and make control (using the PWM controller) rather simple.

I hope that answers your question.

Regards,
Tahmid.

Reply



zvizdic May 2, 2013 at 11:54 AM

This comment has been removed by the author.

Reply

▼ Replies



zvizdic May 2, 2013 at 1:31 PM

Sory PIC16HV616.

As I can see it is the same as PIC16F684

Thanks for replaying

Reply



megapower May 6, 2013 at 12:56 AM

Hi Tahmid,


I am trying to make a sine wave inverter using dsPIC33FJ16GS504, please let me know the procedure of generating sine wave with this pic, what factors to consider and all.

Regards,

Reply

▼ Replies



Tahmid  June 22, 2013 at 9:36 AM

The factors to consider are, if not the same, similar. The difference will lie in the implementation.

Regards,
Tahmid.

Reply

Anonymous June 5, 2013 at 5:07 AM

Dear Tahmid

I've run your code: sine by PIC16F684. But the last place on the oscillators.

I want send Email to you, but I have not your email.

I send link (files : oxilo.JPG and invert.rar) : <http://www.4shared.com/account/home.jsp#dir=z5tArTzu>

Can you repair?

My email : mr.danghoangtung@gmail.com

Help me.

Thanks Tahmid

Bests Regard

Tung

Reply



Unknown June 6, 2013 at 2:36 PM

Hi Tahmid,

thanks for explaining the above but why cant the same result be gained by simply incrementing one variable and using it to point to the sine values sequentially then resetting that variable when it becomes equal to the number of values? I have loaded and understood your code and method but can't understand why this simpler method will not produce the same results. When I run my code in Proteus it only shows the middle few values/pulses then flat for the rest of the signal. Is the code "falling over it's self" because it's not using large numbers or could it be a fault in Proteus? Could really do with some advice on this as I can't find any obvious fault in my code. I'm waiting for an oscilloscope to be delivered (which I needed any way) so I can determine whether it is a fault in the simulation software but when I run your code it simulates fine.

Regards,

Dale

Reply

▼ Replies



Tahmid June 22, 2013 at 9:35 AM

Do you mean to say that you're going to have all the values in the sine table and don't want to repeatedly call one value? But instead leave that to the sine table?

Upload what you've done so far. I'd like to take a look.

Regards,
Tahmid.

Reply

Anonymous June 28, 2013 at 11:42 AM

hi tahmid, can you show me how to generate code for multicarrier signal. For example, sine signal is compared with four carrier signals?

hope you can help..

Reply

▼ Replies



Tahmid August 7, 2013 at 1:10 AM

Why do you require comparing sine signal with four carrier signals? Why is the multicarrier signal approach required?

Reply



Microjack July 5, 2013 at 4:20 AM

Hello Tahmid,

I got error CMCON0 = 7 undeclared identifier when build to PIC16F690, Can I remove this without affecting operation of the given codes or function? seems build successful if I comment it out...


hope for your reply.

regards,

Reply

▼ Replies



Tahmid  August 7, 2013 at 1:13 AM

Remove that line and instead write:

```
CM1CON0 = 0;  
CM2CON0 = 0;
```

The PIC16F690 has 2 analog comparators and thus the change is required. Consult the datasheet for further details.

Hope this helps!

Regards,
Tahmid.

Reply




Unknown July 6, 2013 at 11:20 AM

sir can u help me to make a adjustable frequency just a switch from ports to change SET_FREQ = 492; to 3 other set of frequencies?

Reply

▼ Replies



Tahmid  August 8, 2013 at 2:11 AM

The 3 frequencies will have three corresponding values of SET_FREQ. You will just need to change SET_FREQ to the required value to get your required frequency. The article here explains how to calculate the value of SET_FREQ for different frequencies. If you have any further questions, feel free to ask!

Regards,
Tahmid.

Reply

Anonymous July 8, 2013 at 4:36 AM

hi Tahmid, can i use sg3525/tl494 pwm for chopper transformer and after that i convert it to dc volt and then use your above h-bridge circuit for output as in china inverters or apc use????
design become like this 12v -> chopper transformer -> 280v ac now convert it in 280v dc -> and convert in Ac for load directly on h-bridge ...

Reply

▼ Replies



Tahmid August 7, 2013 at 1:18 AM

Yes you can do this. That's how high frequency inverters work.

Regards,
Tahmid.

Reply



Unknown July 31, 2013 at 5:42 AM

sir please tell what will be the value of set frequency with 80 or 90 samples and frequency 50HZ

Reply

▼ Replies



Tahmid August 7, 2013 at 1:17 AM

Please go through this article thoroughly. I've covered this in this tutorial. If, after reading, you have doubts or specific comments, feel free to ask.

Regards,
Tahmid.

Reply



Unknown August 5, 2013 at 6:05 AM

Sir please can you let me know where the error is in my calculations for SET_Freq and PR2 because I am using a Quartz of 4MHz and wondering a switching signal of 20KHz and then controlling H-bridge which gives at the output 50Hz;for that I determined as follow the following values:

1.PR2=((1/PWM_Period)/(1/Fosc)*4*1)-1 So I found:((1/20000Hz)/(1/4000000Hz)*4*1)-1=49

2.SET_Freq=293; SET_FREQ = [65536/((Number of sine table values) * (Number of times each value is to be called))];I am using 32 values in the sine table and I saw that at 50Hz the period =20ms;its half is 10ms and then at 20KHz ,the period is 50us so;50us*32=1600us (=1.6ms) for completing a half cycle of 10ms calling 32 values each one has to be called 7 times;thus 1.6ms*7=11.2 approximately equals 10ms.

So SET_Freq=(65536/(32*7))=292.57 so I took SET_Freq=293.the problem I have is that my circuit at the pins of PIC I am not getting 50Hz but 14.76Hz;can you please tell me where I am wrong?Thanks for your helpful blogs.

Reply




Unknown August 7, 2013 at 3:24 PM

slam bai i am awais from pakistan and i have assigned the project swmp with output upto 380 volts plz tell me how can i use ir 2101 for mosfet driving and connection with ferrite core transformer i am using the tl 494 pwm controller

Reply

▼ Replies



Tahmid  August 8, 2013 at 2:14 AM

What is swmp? Did you mean SPWM?

Does your output need to be adjustable?

Describe your specifications in greater detail.

Regards,
Tahmid.

Anonymous August 29, 2013 at 9:45 AM

<http://sandysplash.blogspot.in/>

Reply



Unknown August 7, 2013 at 3:25 PM

thanks in advance brother reply plz

Reply

Anonymous August 13, 2013 at 8:34 AM


Hi Tahmid

can i get variable frequency if i change SET_FREQ value continuously?

Reply

▼ Replies



Tahmid  August 25, 2013 at 6:12 PM

Yes, you can alter the frequency by altering the value of SET_FREQ.

Regards,
Tahmid.

Reply



Unknown August 19, 2013 at 6:15 AM

Nice Post!! pretty informative..thanks for providing such a nice post.
China Inverter

Reply

Anonymous August 22, 2013 at 11:41 AM

Hi Tahmid,

That's excellent explanation of sine generation.

Could you please explain the feedback loop?

suppose we generate 230V from SPWM, how do we maintain the voltage on no-load to full-load condition?

Thanks in advance.

Reply

▼ Replies



Tahmid  August 25, 2013 at 6:15 PM

Thank you for the compliments.

What I did for feedback was use a "variable" sine table. Basically the sine table had a set of values for different duty cycles and loaded the required set of values depending on the output voltage and if it needed to be increased or decreased.

Take a look at this:

<http://tahmidmc.blogspot.com/2012/11/feedback-in-sine-wave-inverter-pic16f.html>

Regards,

Tahmid.

Reply



Unknown August 23, 2013 at 5:47 AM

Really nice blog!! I am glad to read your post, pretty informative..thanks for providing such a nice post.
China Inverter

Reply

Anonymous August 27, 2013 at 2:00 AM

Hi Tahmid

I have generated a sinewave with a single PWM pin on a microcontroller.

Across the PWM pins(after AND gate) if i connect a RC filter, i get a good sinewave.

But now i connect this to an H bridge with driver(which is working from another inverter) i see lots of problems.

1)Cross conduction, even after adding 0 at both ends)

2)crooked sinewave

What could this be? Is it that, in the ISR updates are slower than overflow period of 62.5us?.Although my controller is running at 8MHz.

i checked that the ISR requires close to 37usec.How can the code run then?

Reply

Anonymous August 27, 2013 at 7:06 AM

Hello Tahmid great article

Can you write a tutorial to generate 3 Phase waves using similar method?

Reply



Unknown August 31, 2013 at 8:33 PM

I have built the circuit but my transistors burnt at output.what do i do?

Reply

Anonymous October 15, 2013 at 8:11 AM

Hello

I am trying the single phase LUT with different index pointers to generate a 3 phase PWM.

i use

0 25 49 73 96 118 139 159 177 193 208 220 231 239 245 249 250 249 245 239 231 220 208 193 177 159 139 118 96 73 49 25

and generate 3 PWMs at 0, 120deg and 240deg with differing indexes.

But i find that drives in same limbs cross conduct.

How is this normally done? can you please help me?

I have a 6-channel timer to generate a 16KHz PWM on all 6 channels

Reply



Unknown November 10, 2013 at 10:00 AM

hello mr tahmid....can this program run for pic18F4431...i need to do project for 3 phase spwm to run induction motor...thank for ur advise mr tahmid...

Reply



Unknown November 14, 2013 at 7:37 AM

Can you share me the full schematic of the system is not true sine inverter. I needed it. You send her into luankdt01@gmail.com address. Thank you very much.

Reply



Unknown December 1, 2013 at 7:11 AM

Hi tahimid,

I am doing my mtech thesis on transformerless inverter for pv system. I am planning to use PIC for generating PWN signals (SPWM method). Since I am a beginner can you give me instructions to start...

Reply



Unknown December 7, 2013 at 11:09 AM

hi Tahmid, i'm doing a project about modulation & demodulation ASK signal use pic 16f887.In demodulation circuit, i use ADC of pic to decoder the original signal (the original signal is a char 8 bit EX:"10101010 ") but i can't do it. Can you help me? Thank you so much!

Reply

sine wave inverter December 27, 2013 at 12:57 AM

I actually added your blog to my favorites and will look forward for more updates. Great Job, Keep it up.

Reply

Anonymous March 5, 2014 at 3:12 AM

Hi

What happens when you have like this: a 1024 point sine table for $[0..pi/2]$ you want 50 Hz for output frequency and have a PWM frequency of 1500 Hz? I get that the total time would be larger then even the 20ms period
Thanks in advanced

John

Reply



Unknown April 23, 2014 at 10:55 AM

Hello,

Have made several attempts to implement this code using a PIC18F4550 but did not get any satisfactory result (I have no experience with the MikroC compiler). You could edit the code to use this pic, compile and send to me the files on it (design. mcppi and. hex)?

Thanks in advance!

Lenilson

Reply



Unknown May 3, 2014 at 11:35 AM

Hi

I have to generate SPWM for 3 phase inverter .But with Your logic the number of sine values should always be 2 raised to some value then how will I be able to generate 120 degree out of phase signals?Please do reply

Reply

Anonymous August 23, 2014 at 4:25 PM

Hello Tamihd:

I know as mikroC program so I can not fully understand the whole development given here:

1 Tomas 32 values (sine table with $PR2 + 1 = 249$ and $T_{pwm} = 62.5 \mu s$)

2 The half cycle of the sine wave of 50 Hz is 10 ms

Then these data values must have 160 ($10ms / 62.5 \mu s$) but there are only 32 values. This means that the 32 values are repeated 5 times in the 10 ms

Question 1 Since no representing the repetitive values in each of the true value of energy stored in each of them, it does not distort the output sine wave output filter requiring a larger LC ?.

Question 2: To design the ferrite transformer which is the frequency used ?.

Question 3 could rethink this development considering the 160 values within 10 ms and stop using pointers?.

José

Reply

HARISH MANIKANDAN October 19, 2014 at 12:14 PM



hello Tahmid ,
your articles are really helpful.I have a doubt .

how does the implementation of Spwm in practically differ from that of silmulations??

1)If i want to change the number of pulses per half cycle in SPWM say around 12 or 30 and my reference signal is 50Hz sine, then the pwm frequency comes around in Hz and for this the value of PR register exceeds the max value it can hold of 256.how to deal with this

2)Also Another doubt is that should the sine table values be taken according to the number of output pulses we can need

(generation and implementation of sine table)

3)how to use Timer interrupts to send the value as many times as we want to make sure that the output frequency is 50hz

Reply



Unknown October 27, 2014 at 5:35 PM

This comment has been removed by the author.

Reply

Anonymous October 28, 2014 at 5:30 PM

Tahmid: I can generate SPWM code for 60 Hz using a PIC16F874 but I cannot generate any code outside of the ISR. Does this interrupt program use all the processor time or do I have something wrong in my interrupt?

Reply



Unknown November 7, 2014 at 4:30 AM

Hi Tahmid,

I build this inventor on H bridge powered on 325VDC, I have one question is normal output after LC filtering not sine wave, but square wave ? Once connected to the load in output, output is sine wave it is normally ?

Reply

Anonymous December 1, 2014 at 5:58 PM

Hello Tahmid,

I combined a pic16F690 + a hip4081 + a bridge made of 4 irfp064's + 4 extra super fast shotkey's protect the bridge (i know the fets have their own shotkeys already inside the package) but it's just to be sure they can handle the generated currents. The mos gate's are protected by 15v zeners to prevent overvoltage (with is normally not needed in a 12V system but you never know ...) I adjusted the original code as you explained above to shut down the CM1CON0 and the CM2CON0. The problem. It doesn't work and i do not have a scope to look at the generated signals. However: my multimeter does measure frequency and pwm duty, so i can see the 50hz low side drive signals and the 7 - 8 khz high side signals. So the code does work and the chip is programmed as it should. But that's all i can see with inferior measurement equipment. Strange thing is that the 4081 (unlike the 4080) wants his input tied to ground to be enabled. (i tested the setup with 2 leds and just some wires) So my guess was that the 4081 inverts the pwm input from the pic and thus 0 comes out as 255 and vice versa. Which would generate a mirrored sine. I could have inverted the pwm with a cd4*** not gate but that requires yet another chip. If you use a processor to do the job i think that is just a very stupid plan. So if the driver inverts the signal i should just invert the pwm values before i feed it to the driver stage to get the correct pwm at the output. So i inverted your list (255, 230, 206, ...) and i pushed that into the driver stage. But then again it refused to work like it should. I placed 2 leds into the bridge to visually look at what is happening inside. What i see is that the leds are not blinking very equally and in a kind of semi random from of way. But like i said i don't have a scope to look at what is really happening inside the bridge. I may have overlooked something but i don't see where that could be? Can you make a guess what i could try to make it work? I feel stupid to ask this but maybe you have an

obvious solution that i just dont see for the moment ... I'm not that familiar with pic's and i plan to move your code inside a 8051 type of micro. Witch i understand much better than pic's. But to start with i would like to see your setup work before i move it to my micro of choice ...

Kind Regards,

Tom

Reply

Ahmed January 25, 2015 at 10:48 PM

hi , Thanks for your helpful post, but please from what you know that the maximum ECCP frequency is 20 Khz , please help because i thik it 's more than 200 Khz

Reply

Ashab Uddin January 29, 2015 at 2:10 AM

Hi Tamhid:

Can you tell me about the filter you used for producing pure AC wave from SPWM.

Reply

Ashab Uddin January 29, 2015 at 2:13 AM

Hi Tamhid:

Can you tell me about the filter you used for producing pure AC wave from SPWM.

Reply



Unknown May 2, 2015 at 12:07 PM

Is this circuit applicable for inverting 12 volt dc voltage to 220 volt ac voltage.

Reply



Unknown May 22, 2015 at 10:56 AM

mr tahmid may ive ur email plz?

Reply



Picmikroc programming Urdu Hindi July 1, 2015 at 11:51 AM

```
//-----  
//Programmer: Syed Tahmid Mahbub  
//Target Microcontroller: PIC16F684  
//Compiler: mikroC PRO for PIC (Can easily port to any other compiler)  
//-----
```

```
unsigned char sin_table[32]={0,25,49,73,96,118,137,  
159,177,193,208,220,231,239,245,249,250,249,245,  
239,231,220,208,193,177,159,137,118,96,73,49,25};
```

```
unsigned int TBL_POINTER_NEW, TBL_POINTER_OLD, TBL_POINTER_SHIFT, SET_FREQ;
unsigned int TBL_temp;
unsigned char DUTY_CYCLE;
```

```
void interrupt(){
if (TMR2IF_bit == 1){
TBL_POINTER_NEW = TBL_POINTER_OLD + SET_FREQ;
if (TBL_POINTER_NEW < TBL_POINTER_OLD){
CCP1CON.P1M1 = ~CCP1CON.P1M1; //Reverse direction of full-bridge
}
TBL_POINTER_SHIFT = TBL_POINTER_NEW >> 11;
DUTY_CYCLE = TBL_POINTER_SHIFT;
CCPR1L = sin_table[DUTY_CYCLE];
TBL_POINTER_OLD = TBL_POINTER_NEW;
TMR2IF_bit = 0;
}
}
```

```
void main() {
SET_FREQ = 410;
TBL_POINTER_SHIFT = 0;
TBL_POINTER_NEW = 0;
TBL_POINTER_OLD = 0;
DUTY_CYCLE = 0;
ANSEL = 0; //Disable ADC
CMCON0 = 7; //Disable Comparator
PR2 = 249;
TRISC = 0x3F;
CCP1CON = 0x4C;
TMR2IF_bit = 0;
T2CON = 4; //TMR2 on, prescaler and postscaler 1:1
while (TMR2IF_bit == 0);
TMR2IF_bit = 0;
TRISC = 0;
TMR2IE_bit = 1;
GIE_bit = 1;
PEIE_bit = 1;
```

```
while(1);
}
//-----
```

```
HEX MEIN KOI CNVERT KR DE
PLZZ
FRIENDZZZZZZZZZZZZZZZZ
```

Reply

Sasanka September 21, 2015 at 12:44 AM

Thanks for a wonderful post....spwm waveforms are generated...but I have not been able to debug your code...please help.

Reply



Unknown October 21, 2015 at 6:20 AM

Tahmid what are the frequencies of P1A,P1B to P1D For 50hz frequency

Reply



Unknown December 21, 2015 at 8:29 PM

never Mind Answering..... for the BENEFIT OF OTHERS....P1A AND P1C on an Oscilloscope shows 50hz....P1B AND P1D show roughly 16khz..... but you'd see a varying duty cycle..... Regards.

Reply



jhony February 10, 2016 at 1:10 PM

How to exactly match inverter frequency to grid in grid tied application? Any one?

Reply



Unknown March 28, 2016 at 3:37 PM

hi Tahmid ,tanks a lot

What is the equivalent of registers PR2 and CCPR1L in micro controller avr?

Reply



Unknown April 10, 2016 at 2:34 PM

Can this program be used for 3 phase inverter, with 6 igbts....how?

Reply



Steve May 6, 2016 at 5:03 PM

Hi Tahmid. Your articles are really great.

Idonot know why i obtain a sine wave amplitude of 6V on my oscilloscope in proteus after supplying my H-bridge with 12V.

Reply



KevinLeeKaiWeng June 12, 2016 at 5:54 AM

Hi Tamid,

I've build a H-bridge circuit in Proteus but it shown some error when I run the simulation but I couldn't find out which part did I built wrng.

Reply



KevinLeeKaiWeng June 12, 2016 at 6:06 AM

The error states that "Time step too small" and "problem node #v:q4:f1#branch" but my circuit does not have this branch.

Reply



Unknown August 31, 2016 at 10:13 AM

Hi Tahmid, very illustrative examples, how can I do if I have a bipolar power source (+) & (-) in the hv side? should I connect the (-) to common earth in order to have a same circuit reference?

Reply

kenneth March 17, 2017 at 1:57 AM

hello sir its that pure sine wave? thank you

Reply



Unknown April 13, 2017 at 1:03 AM

Hello Tahmid ,

Can you please tell your email id ??

Reply



Tayssir April 18, 2017 at 4:44 PM

Hello Tahmid ,

what about pic 12f683 is it good for this code or pic 16f684 is better and can i use the same code for both ?

thanks alot sir Tahmid

Reply



Unknown July 2, 2017 at 9:51 PM

I'm just wondering since you are using the ECCP mode (Full Bridge Forward and Reverse) and looking at the data sheets, at these modes only on pin is modulated(PWM) and the other is ACTIVE HIGH. According to what I know both pins should be modulated? How's that? Thank you!!

Reply



Unknown August 10, 2017 at 6:09 PM

Hello Tamid, please I need ur assistance.

Reply



Unknown November 16, 2017 at 7:19 AM

Hi, Your post about sine wave inverter using PIC was a great help. Can you please explain feedback mechanism in sine wave inverter using dsPIC30F/dsPIC30F.

Reply



Unknown November 24, 2017 at 1:06 PM

Hi Tahmid, i'm from Brasil!

Im working in your project in a half-bridge inverter, and a can't undesrtand how to communicate the PWM to IR2112 and mosfets. The pins RC3/RC5 from uc goes to LIN/HN to control low an hi components, right? And how the PWM is connected into de mosfets?

Could you help-me?

Thank you.

Reply



Unknown February 21, 2018 at 10:48 AM

hi tahmid .

is this code full? if not, May you send my mail?

ALLAH bless you

Reply



Unknown March 13, 2018 at 4:54 AM

Hello Sir,
Witch controller use for 55khz sine wave generator using SPWM....

Reply



Unknown March 15, 2018 at 3:46 AM

Great work keep it up
Can I do this with at89s52 and how should I proceed
Thanks

Reply



Unknown March 22, 2018 at 6:30 AM

hi can you say whether IR2110 is suitable for 80khz pulses to drive the mosfet.if it no so ,tell me the better choice

Reply

▼ Replies



Unknown March 22, 2018 at 9:43 AM

It is very suitable. You can crosscheck from the datasheet

Reply



Unknown March 23, 2018 at 8:09 AM

Hello sir I'm new in this blog and appreciate your circuit thank for helping people in this blog please I been searching for a circuit to contact with my old inverter board the second stage to produce out put A/C 220v it chopper inverter please can you help me or design me with microcontroller thank you hope to hear from you soon

Reply



Unknown March 23, 2018 at 8:12 AM

Hello sir I'm new in this blog and appreciate your circuit thank for helping people in this blog please I been searching for a circuit to contact with my old inverter board the second stage to produce out put A/C 220v it chopper inverter please can you help me or design me with microcontroller thank you hope to hear from you soon

Reply



Unknown June 5, 2018 at 3:28 AM

Hi Thanks for your Tutorial on Sine wave Invertor...

i have 1Kva (ferrite core Transformer) invertor, i wrote a program 220V 50Hz AC. its show 220V AC and 50Hz on multi meter but when i plug a 50Watt bulb on invertor voltage drop upto 60V.

Original program working properly. if you have any suggestion please send.

using micro controller : PIC16F716

Thnaks

Reply



juma July 9, 2018 at 12:21 AM

Help code in pic12f683

Reply



Jerry July 18, 2018 at 7:01 PM

Please can you share the hex file in a file formats not in a written so that I can easily upload it I will be very glad since am a novice in programming.

Reply



Ammasi September 12, 2018 at 4:03 PM

How to calculate this sine table for 25Khz instead of 50Hz?

Reply



dimi December 21, 2018 at 3:42 PM

hi thamid,where is the feedback circuit in this project? thank you..

Reply



officecomsetup August 23, 2019 at 3:14 AM

Thanks for sharing this marvelous post. I m very pleased to read this article.

norton.com/setup

norton.com/setup

norton.com/setup

office.com/setup

mcafee.com/activate

mcafee.com/activate

Reply



JAMES ANDERSON September 24, 2019 at 3:59 AM

While some businesses may be hesitant about shifting to cloud, Office 365 does have several essential features and advantages. Workers are already adept at working on Office applications, by getting Office 365 and activating the setup ms office-setup your business not just gets the chance to utilize the safe efficiency programming which it has been utilizing for a considerable length of time, yet you can likewise give the obligation on tech giant Microsoft. for more detail visit to our website

www.office.com/setup

Reply



Adam Jon December 1, 2019 at 2:35 AM

Secure your device with norton antivirus without worrying about viruses and online threats.It protect your PC tablet and notepad from all kind of virus and malware activity and provide you full protection.

n-norton-norton.com

Norton.com/setup

Reply



ronald December 7, 2019 at 5:04 AM

Webroot.com/safe is useful in evacuating all sort of infections, spyware, worms, trojans and a lot increasingly against computerized components.

www.webroot.com/safe

Reply



ronald December 7, 2019 at 5:06 AM

Presently days everybody who uses advanced gadgets needs best degree of security. That is the reason webroot has propelled different kinds of security arrangements like web security complete, web security furthermore.

www.webroot.com/safe

Reply



us-officeoffice December 24, 2019 at 2:15 AM

Good blog for this site. Commenting on a blog is an art. This site article is very good.

www.office.com/setup

office setup

norton setup

Reply



norton January 15, 2020 at 5:18 AM

The Norton Setup at www.norton.com/setup Norton setup is a process where reach you enter the Norton Setup Key at www.norton.com/setup to trigger & install Norton product. One can get your hands on Norton from retail include or online.

Reply



finnjordan100 January 16, 2020 at 12:31 AM

Webroot SecureAnywhere Antivirus scans your system quickly and protects you from viruses, rootkits, keyloggers and other harmful programs.

www.webroot.com/secure | webroot.com/secure | [Install Webroot With Key Code](#)

Reply



finnjordan100 January 16, 2020 at 12:31 AM

AVG Secure is designed to keep your digital info safe and secure. Learn about its pricing, security features, and more in this review.

www.avg.com/retail | www.avg.com/activate | [AVG Download](#) | avg.com/retail

Reply



norton-nortoncomsetup.uk January 16, 2020 at 11:59 PM

The Norton Setup at www.norton.com/setup Norton setup is a process where reach you enter the Norton Setup Key at www.norton.com/setup to trigger & install Norton product. One can get your hands on Norton from retail include or online

Reply

Anonymous January 22, 2020 at 5:29 AM

Norton is one of the top most antivirus for computers and gadgets, to download and setup Norton antivirus you need to visit **Norton.com/setup** or **www.norton.com/setup**. In this article we will guide you all steps which are necessary to activate Norton antivirus on windows.

Reply



Daniel Smith February 19, 2020 at 4:43 PM

You're a gifted blogger. I have joined your feed and anticipate looking for a greater amount of your awesome post. Additionally, I have shared your site in my informal communities!

MCAFEE.COM/ACTIVATE

NORTON.COM/SETUP

Office.com/Setup

NORTON.COM/SETUP

Reply



i-nortonnorton March 18, 2020 at 1:38 AM

In order to ease this process while not compromising the security, **www.norton.com/setup** provides streamlined support to configure **Norton Setup** Application. If a user seek to but this software, they can either use a retail card that allows an online method of installation or use a physical CD for a more manual approach of installation.

Reply



i-nortonnorton March 18, 2020 at 1:39 AM

Here is a list of the channel include with some additional add-ons. The local channel may not be part of the Hulu agreement, but premium channels are available on demand for live TV channels in this on-demand Hulu live TV service. The activation link is hulu.com/activate and falls into this category.

Reply



i-nortonnorton March 18, 2020 at 1:39 AM

Activate Hulu by using **www.hulu.com/activate** and revel in live on-demand streaming provider **hulu.com/activate**. Find out how to do hulu.com/activate efficiently with convenient steps.

Reply



James Tech June 11, 2020 at 8:37 AM

Nice post, you give the clear idea of the topic and I subscribed your blog, I have some links to share here

Mcafee.com/activate

www.Mcafee.com/activate

Reply



thenortonsetup.com June 11, 2020 at 9:09 AM

It is a very helpful and informative blog post. I would like to thank to you for providing such information I have also have a website providing very good information.

norton.com/setup
www.norton.com/setup

Reply



John Shaw June 11, 2020 at 9:51 AM

Good Work, i like the way you describe this topic, keep going. i would like to share some useful security links here please go through.

mcafee.com/activate
www.mcafee.com/activate

Reply



Vengu June 15, 2020 at 1:25 PM

Hi thamid Thanks for the Article please clarify the controller Atinny44A its better suitable this code and i need additional feature for Shutdown pin for any bridge error. Please guide me how to modify this program if possible please mail me : infovengu@gmail.com

Reply



Richard June 16, 2020 at 7:12 AM

norton.com/setup

- Norton is one of the best antivirus software which protects your computer from various malware and viruses. It is introduced by Semantic Corp. It works in various Operating Systems like iOS, Windows and even in Android. It provides various security essentials to your system like antispyware, antivirus and antimalware. For any support and help in antivirus please contact us. click on - norton.com/setup

mcafee.com/activate

- McAfee is an antivirus that detects and eliminates harmful viruses from your system. It is one of the best two-way firewall security available for users that blocks infected sites automatically. Also, it offers several premium features that a user can grab to enjoy virtual life conveniently. For More Information Visit- mcafee.com/activate

McAfee Activate - These days internet attackers are creating advanced malware and viruses to steal valuable information from your computers. In order to get rid of these threats, you should install a robust and reliable antivirus program on your Mac or PC. McAfee is one of the most known security suites for computers and other digital devices. By installing McAfee in your computer, you can prevent your device from such internet threats and malicious software. McAfee has won the trust of millions of customers worldwide. For MOre Detailsd visit- mcafee.com/activate

Reply



jammy June 22, 2020 at 6:06 AM

Amazing and Interesting things to read and learn. Its amazing to find something interesting and cool stuff. Enjoy shayari and dosti shayari and share them.

Reply



remmy June 30, 2020 at 4:20 AM

Thank You for sharing your article, This is an interesting & informative blog. It is very useful for the promoter like me. lamcafee is an oriented antivirus software for pc or mobiles. McAfee items ensure that each need of the clients is satisfied. So laMcAfee items are structured in light of keeping this. This is the reason there are such a large number of McAfee programming accessible on the web. Be it McAfee Total Protection, mcafee.com/activate | [mcafee login](#) | [install mcafee with activation code](#)

Reply



remmy June 30, 2020 at 4:31 AM

mcafee.com/activate as antivirus of virus furnishes you with the security shields to prevent malicious documents from entering in the Desktop, PC/cell phone by means of malware, spyware, rootkit, and Trojan ponies. As individuals all around the globe complete their regular work on their official and PCs, they require absolute protection from a wide range of dangers that these infection records can cause. These infections are produced abruptly from old PC-stuck records or dubious Trojan pony, spyware, and malware online sites.

mcafee.com/activate | www.mcafee.com/activate | [mcafee download](#) | [mcafee activate](#)

Reply



remmy June 30, 2020 at 4:47 AM

Norton is extraordinary compared to other security Antivirus for any of your gadgets. This isn't only a normal device that expels invisible viruses and reports bugs. Be that as it may, this is one entire full security arrangement for your Device. Mac or Windows as well as it works with different tablets and even cell phones as well. With security being the fundamental focal point of the Norton 2020 security frameworks, it additionally spares you from potential dangers and cautions you.

[|| norton download](#) | [norton login](#) | norton.com/setup | [Norton setup](#) | [norton password generator](#)

Reply



remmy June 30, 2020 at 4:59 AM

office.com/setup : Microsoft Office is utilized by the greater part of the individuals to complete their work in an orderly and sorted out way. **office setup** comes with various adaptations like Office 2019, Office 2016, Office 2013, and Office 365. Each Microsoft program is utilized for various assignments. Every adaptation of the Microsoft Office Setup needs an item code to complete its actuation procedure. Microsoft Office is utilized for both the reason whether it is for home or business. This assumes a significant job on the off chance that you like to keep your work in an efficient manner : **microsoft redeem code**

Reply



remmy June 30, 2020 at 5:00 AM

office.com/setup : Microsoft Office is utilized by the greater part of the individuals to complete their work in an orderly and sorted out way. **office setup** comes with various adaptations like Office 2019, Office 2016, Office 2013, and Office 365. Each Microsoft program is utilized for various assignments. Every adaptation of the Microsoft Office Setup needs an item code to complete its actuation procedure. Microsoft Office is utilized for both the reason whether it is for home or business. This assumes a significant job on the off chance that you like to keep your work in an efficient manner : **microsoft redeem code**

Reply



sarah johnson July 23, 2020 at 3:14 AM

www.office.com/setup is the third party activation and setup, if you want to download and install ms office setup then visit office.com/setup

Reply



sarah johnson July 29, 2020 at 11:55 AM

How to download and install microsoft office on your device. Follow the steps given here. Ms office is best application of microsoft application.

www.office.com/setup, office.com/setup, office setup, office 365 setup, install ms office, ms office setup

www.office.com/setup, office.com/setup, office setup, office 365 setup, install ms office, ms office setup,

www.hulu.com/activate, hulu.com/activate, hulu com activate, hulu activate, hulu.com/activate, Hulu Activation Code

www.hulu.com/activate, hulu.com/activate, hulu com activate, hulu activate, hulu.com/activate, Hulu Activation Code

Reply

Anonymous July 30, 2020 at 8:21 AM

McAfee is a popular antivirus protection product which secures your computers and laptops from malware attacks. You can download this antivirus from mcafee official website mcafee.com and login with a few steps. I personally used it and it has secured my system for 6 years . you can login by using mobile through mcafee my account login. For more information visit our website

<https://mcafeepro.com/>

Reply



Isabella Wilson August 5, 2020 at 12:57 AM

It is very simple to get McAfee to secure your devices. Just go to McAfee's website and download it. But, we can understand that one might face several difficulties in the process of activating the McAfee Account. Believe us, there is literally nothing to worry about while you try and figure out the McAfee Total Protection Login process. It is a cakewalk through a few very, very simple steps that you need to follow, and then you are good to go for McAfee's account login.

<https://mcafeepro.com/>

Reply



Xperria August 21, 2020 at 5:09 AM

This is very informative post, good work, i like this content and wish to read more from you. Thanks for such a informative post. I also like to share

McAfee Login

McAfee Total Protection Login

McAfee Antivirus Login

McAfee Login Mobile

Reply



McAfee Login August 27, 2020 at 8:03 AM

McAfee Antivirus Login Account is your one step key solution for accessing and utilising benefits and features of the McAfee security. This online platform allows you to manage your subscriptions as pro.you will need to scan your computer with McAfee antivirus to resolve all viruses and malware from your computer. If you get a problem or error, get live support with easy access to McAfee Login to solve all issues.

McAfee Account Login

Login McAfee Account

How to Login McAfee Account

McAfee total protection login

Reply



Xperia September 5, 2020 at 6:06 AM

McAfee is an antivirus that provides protection to your device from various online threats. McAfee account login will help you to use various features. You first have to start with the McAfee login process for getting access to all the information regarding your McAfee account. The login is simple as well as an easy process.

<https://mcafee.com/>

Reply



wcomwebroot September 14, 2020 at 1:17 AM

This may be a best place to introduce yourself and your website or include some credits.

www.webroot.com/safe

webroot.com/safe

webroot safe

Reply



Sophie Lee September 23, 2020 at 9:53 AM

Plenty of people eager to make new connections on Plenty of Fish. Want the best mobile experience? Learn how to search plenty of fish is to Pof Mobile Login where you can get 100% free online dating.

For more details visit!

<https://plenty-offish.com/>

Reply



PlentyOfFish September 30, 2020 at 7:30 AM

Plenty Of Fish Login: Plenty of fish is one of the largest global online dating Website used by the highest number of participants aged between 25-34. The age ranges are divided nearly evenly between males and females. The United States has the highest number of users in the world. It also has, of course, the largest number of Plenty Of Fish Login. Visit here for login <https://plenty-offish.com/>

Reply



www.Mcafee.com/Activate | McAfee Activate Key | McAfee.com/Activate | McAfee.com/Setup November 2, 2020 at 1:28 AM

McAfee Antivirus Tools are developed by Symantec Corporation, provides a complete Anti-Virus suite for PCs. o to your McAfee Antivirus software and Open it. · Enter the 25 digits alpha-numeric product key that was mailed to you

www.mcafee.com/activate

mcafee.com.com/activate

[mcafee activation](https://mcafee-activation.com/)

Reply



camila smith November 7, 2020 at 11:21 PM

Delta Airlines Reservations || Delta Airlines Flight Reservations

Reply



camila smith November 11, 2020 at 4:13 AM

I simply want to say I am just very new to weblog and honestly enjoyed you're web page. Probably I'm planning to bookmark your website. You absolutely have impressive well written blog. Thanks for sharing! Know about Allegiant Airlines Reservations

Reply



Suzanne Parker November 17, 2020 at 6:16 AM

Roadrunner email is viewed as extraordinary compared to other email stages and it is additionally simple to utilize. Roadrunner can be used for both professional and personal use. You can access the free email service of Roadrunner from anywhere but just make sure to have Internet access on your computer. Your roadrunner Email phone number helps you in the best way possible.

<https://xperria.com/email-support/roadrunner-email-phone-number/>

Reply



camila smith December 12, 2020 at 9:27 AM

American Reservation
American Airlines Reservation
American Airlines Reservation Phone Number
American Airlines Customer Number
American Airlines Official Site
American Airlines Phone Number
American Reservation
American Airlines Reservation
American Airlines Official Site

Reply



Devanshi Singh December 14, 2020 at 12:09 PM

Connect with talented content writers and order high-quality content for your website with Reflekt Visual's professional content writing services. Get content that drives results today. We provide high value content writing services to our clients. Our experts learn about their business, services, solutions, products, etc. to create persuasive content that create attention and improves your sales conversion ratio.

Reply



camila smith December 18, 2020 at 7:46 AM

Alaska Airlines Reservation Number
Alaska Airlines Reservation Phone Number
Alaska Airlines Reservation
Alaska Airlines Booking
Alaska Airlines Reservation Number
Alaska Airlines Reservation Phone Number
Alaska Airlines Reservation
Alaska Airlines Booking
Alaska Airlines Reservation

Reply

Jacob William December 23, 2020 at 1:37 AM

Nice one! thank you so much! Thank you for sharing this post. Your blog posts are more interesting and impressive.

Volaris Telefono

Top snorkeling destinations in the world!

How Do I Connect With KLM Airlines?

How to Waive American Airlines Change Fee?

How to Manage Frontier Airlines Reservations?

Reply

office.com/setup December 23, 2020 at 6:21 AM

it is very useful blog you have shared how to use table pointer in HTML, as i was not aware & when i check your blog again much more knowledge from this .

Thanks

Reply

Jacob William December 24, 2020 at 7:01 AM

Nice one! thank you so much! Thank you for sharing this post. Your blog posts are more interesting and impressive.

Air Travel Mart

Lufthansa Reservations

Singapore Airlines Reservations

Reply



camila smith December 28, 2020 at 1:25 PM

If you have been looking for cheap flight tickets booking, then visit Frontier Airlines Reservations and book your flight tickets.

Reply

office.com/setup December 30, 2020 at 5:34 AM

Sinusoidal waves are also named as varying waves because their behavior is changing and have different values at different point of time.

Reply



camila smith January 7, 2021 at 2:09 AM

Frontier Airlines Reservations

Frontier Airlines Booking

Frontier Airlines Reservation Number

Frontier Airlines Reservation Phone Number

Frontier Airlines Reservations

Frontier Airlines Booking

Frontier Airlines Reservation Number

Reply



camila smith February 3, 2021 at 4:40 AM

volaris telefono
volaris airlines
telefono de volaris
volaris telefono
volaris airlines
copa airlines telefono
copa airlines
copa telefono
copa airlines numero de telefono
copa telefono

Reply



camila smith February 4, 2021 at 7:47 AM

united airlines telefono
united airlines nn español telefono
numero de telefono de united airlines
united airlines
united airlines telefono
copa airlines telefono
copa airlines
copa telefono
copa airlines numero de telefono

Reply



camila smith February 15, 2021 at 3:18 AM

volaris telefono
numero de telefono de volaris
telefono de volaris
volaris telefono mexico
volaris telefono usa
volaris numero de telefono 24 horas
numero de telefono gratis de volaris
volaris telefono

Reply



camila smith February 17, 2021 at 2:56 AM

volaris telefono mexico
volaris telefono
numero de telefono de volaris
telefono de volaris
volaris telefono mexico
volaris telefono usa
volaris numero de telefono 24 horas
numero de telefono gratis de volaris
numero de telefono de volaris
telefono de volaris

Reply



camila smith March 9, 2021 at 2:11 PM

Canon TS3100 Setup
setup ftp server
quickbooks error h101
quickbooks error code 102
Proforma Invoice in QuickBooks
Print Quickbooks Check Register

Reply



mark stone March 23, 2021 at 7:22 AM

At mcafee activate , you can download McAfee , install and activate it. With the best Home network protection, Web Protection, Identity Theft Protection, and Multi-device protection mcafee.com/activate , macfee.com/activate

Reply



Davis March 24, 2021 at 3:42 AM

Canon ijsetup is an independent platform where you can download and install Canon printer drivers for setting up an inkjet printer on PC, Mac and smartphones as well.

[Canon.com/ijsetup](https://canon.com/ijsetup) |
[Http //canon.com/ijsetup](http://canon.com/ijsetup)

Reply



camila smith March 24, 2021 at 10:31 AM

how to use Cash app
How to Connect With Cash App
Cash App Direct Deposit
Cash App Transfer Failed

Reply



Anonymous March 31, 2021 at 3:50 AM

Use benefits from Home and Student setup, Once you purchase the Microsoft office 2019 pack, its essentials to activate the software using the product key.

Office.com/setup Home & Student 2019

Reply



Daniel Coper April 7, 2021 at 5:36 AM

There are numerous approaches to watch Netflix on your TV – all you require is a gadget with the Netflix application! The Netflix application is accessible on many Smart TVs, game consoles, streaming media players, set-top boxes, and Blu-ray players. You can discover more data about viable gadgets and brands at netflix.com/activate, and to enroll visit www.netflix.com/activate or read on to check whether your TV is now Netflix-prepared.

www.netflix.com/register
www.netflix.com/redeem
netflix activation code
netflix.com.au/redeem
netflix.com/tv8

Reply



technical help April 16, 2021 at 6:58 AM

Hi, I am Van Diese, I am working as a tech expert at email support. I have 3 years of experience in this field. If you have any problems related to Bellsouth customer service, etc, then please contact for instant help related to email problems.

Bellsouth customer service number

Reply



camila smith April 28, 2021 at 9:34 AM

You have facing technical issues in cash app direct deposit then now you can feel free to call cash app customer care they will provide you complete solution and resolve your query.

Reply



Smartnstudy April 29, 2021 at 4:25 AM

Nice Blog, you can also check some other related post
bhanwar borana classes

Reply



Anonymous May 10, 2021 at 6:26 AM

Go for multiple actions including lasejet installation, registration, and wireless connect, cartridge installation or more. 123.hp.com/laserjet , 123.hp.com/laserjet , camps.intuit.com .

Reply



ava clark May 13, 2021 at 3:22 AM

Canon manufacturer site ij.start.canon is the platform to get the Canon printer software where you can download the latest printer drivers to start your Canon model for printing, scanning, faxing, copying documents, and more
canon.com/ijsetup | [ij.start canon](https://ij.start.canon) | ij.start.canon | <http://ij.start.canon> | <https://ij.start.canon>

Reply



ava clark May 13, 2021 at 3:24 AM

Office provides all-purpose application bundle. Microsoft allowing users to make documents, presentations, calculations, and reports.

[Office.com/setup](https://office.com/setup) Home & Student 2019 | [Office.com/setup](https://office.com/setup) Home Student 2019 | norton.com/setup | [Cox webmail](https://coxwebmail.com)
Login | [Office.com/setup](https://office.com/setup) Home & Student 2019

Reply



Rod L Davis May 29, 2021 at 8:30 AM

the problem occurs due to inability to sync your AOL email with the Mail app or because of improper configuration. Whatever be the reasons of such issues, after successful

AOL mail login, it is important to fix any problem with the Mail app. Here, in this article, we have mentioned detailed steps to fix AOL mail settings on Windows 10 system.[|cashappsignup|](#)

stripe login
zelle login

Reply



Unknown July 5, 2021 at 1:44 AM

If you are setting the printer for the first time follow the below instructions given and setup your new HP printer easily. Unbox the 123.hp.com/ojpro9025 printer by removing all the packing materials and recycle the materials. solutions.brother.com/windows printers are the all-in-one solution for office use as well as for home use.

Reply

Max Turner July 5, 2021 at 1:45 AM

<https://ij.start.canon> is the solution for easy Canon printer drivers download. <http://ij.start.canon> allows you to install and set up a Canon inkjet printer and ensure that you receive outstanding printing results. canon.com/ijsetup | ij.start.canon | norton.com/setup

Reply



Siva July 10, 2021 at 6:31 AM

amazing information for your website. i am really like this.

[abinayakolamdesigns](https://www.abinayakolamdesigns.in)

<https://www.abinayakolamdesigns.in/2021/06/ask-shirdi-sai-baba-questions-and-answers.html>

Reply



camila smith July 13, 2021 at 2:38 PM

cash app refund
Refund On Cash App
How To Get A Refund On Cash App
Cash App Refund Policy
cash app refund
Refund On Cash App
How To Get A Refund On Cash App
Cash App Refund Policy
cash app refund
Refund On Cash App
How To Get A Refund On Cash App
Cash App Refund Policy
cash app refund
Refund On Cash App

Reply



Alex Thompson July 16, 2021 at 6:05 AM

Japan Airline, Just amazing — they've never been late for me, but Japan airlines ticket cancellation policy is a little bit difficult to understand. After searching so much about the its policy, finally, I got a solution by {[Airlinespolicy.com](https://airlinespolicy.com)}. They have crisp, short, and relevant information about charges, modification, cancellation, check-in, Baggage, and Pet policy. They helped me a lot during the harsh Covid-19 time. I am very thankful to the team of [airlinespolicy](https://airlinespolicy.com).

Reply



travel blogs July 22, 2021 at 8:41 AM

Looking for flights under \$49? Look no more, for you have found the right place! FlightinfoDesk has come up with exciting \$49 flight deals\$49 flight deals.

Reply

Airlines Policy July 24, 2021 at 4:24 AM

Lufthansa airline provides the Lufthansa Cancellation Policy within 24 hours that allows the passengers to cancel their Air tickets within the starting 24 hours of the purchase of the ticket without any Lufthansa Cancellation fee. Visit our site to know more.

Reply



Alex Thompson July 27, 2021 at 5:58 AM

I am a frequent traveler, my personal travel experience says that not all conditions are good to travel by air sometimes conditions caused by nature, and and in some cases by our issues it brings about change or retraction of the booked Air ticket. I generally really like to go with Emirates Airlines since it's straightforward the Emirates flight ticket cancellation procedure offer substantially more adaptability. I'm very thankful to the team of Airlinespolicy.com, who guide me about Emirates Airlines and its all policy in detail.

Reply



Anthony M. Lucas August 6, 2021 at 8:04 AM

vueling change flight 24 hours passengers can cancel a flight booked on Vueling within 24 hours of the purchase. Vueling will provide a complete refund of your ticket cost in case the booking was made a week or more prior to the departure date of your Vueling flight.

Reply



Escort Service August 6, 2021 at 11:15 AM

Major side effects associated with Ativan use and/or abuse include:

- Confusion.
- Lack of muscle control.
- Blood in urine or stool.
- Stomach pain.
- Weight loss.
- Tremors.
- Overdose.
- Addiction.

Reply



HP Printer Support Toll Free Number August 10, 2021 at 7:02 AM

The all-in-one solution for both home and office use is the **www/hp.com/123** Printers. It is important to know the advantages of HP printers. This guide is for new HP printer users. The setup of the HP printer is simple. You will find all information regarding **www/hp.com/123** on this page.

You can install Norton antivirus on your computer by visiting **norton.com/setup activate**. These simple steps can be used to quickly login, download and install Norton setup on your computer.

Reply



amelia August 11, 2021 at 1:43 AM

Cox Email Login is an online login portal that the company provides to its customers enabling them to operate 10 email accounts each capable of 2 GB storage.

cox webmail login |

camps.intuit.com | camps.intuit.com | www.trendmicro.com/activate

Reply



amelia August 11, 2021 at 1:43 AM

How to Set up Microsoft Office with Product Key at office.com/setup

Steps to setup Microsoft Office at microsoft365.com/setup are:

Visit www.office.com/setup and follow the on-screen instructions activation link.

Sign in to your Microsoft account or to manage your Microsoft products' subscription, create one.

Enter your product key or code and click Next.

When your account successfully associated with the key, you'll see the page "My Office account".

Now, Select Install and follow the on-screen instructions.

Reply



Anthony M. Lucas August 16, 2021 at 3:57 AM

hawaiian airlines change flight policy When making date/flight, reroute, or other changes to a ticket, any difference in fare will be charged to the customer in addition to any change fee.

Reply

Max Turner September 3, 2021 at 5:31 AM

The Webroot program is highly rated software to protect your devices & data available for download at ij.start.canon | ij.start.cannon/ts3322 | microsoft365.com/setup | Microsoft365.com/setup

Reply

Max Turner September 3, 2021 at 5:38 AM

Enter Trend micro activation code on www.trendmicro/activate | www.trendmicro.com/activate to download and activate Trend Micro. To activate Trend micro, make sure you already have an activation code that you'll probably enter on the trendmicro.com/activate site.

Reply



FlightTripsMart September 3, 2021 at 9:26 AM

Explore more of our big blue planet with JetBlue. When you reserve your next flight on Travelocity, you'll have access to an abundance of exciting destinations — as well as some of the most affordable fares available. Adventure awaits!

[Jetblue Airlines Tickets](#)

[Jetblue Airlines Flights](#)

Reply

FlightTripsMart September 16, 2021 at 4:41 AM



The biggest cost of my trip is airfare. The cost of the air ticket determines the cost of my travel. For most of us, we canceled a lot of trips because we only approved our worksheets at the last minute, and the ticket cost became so expensive that the entire trip exceeded our budget.

United Airlines flights

United Reservations

Reply



Andrew Stark September 17, 2021 at 8:50 AM

Good Work, i like the way you describe this topic, keep going. i would like to share some useful security links here please visit [mcafee.com](https://www.mcafee.com) activate

Reply



Unknown September 28, 2021 at 6:07 PM

We are focused on giving our visitors an experience that will bring mental, physical, enthusiastic, and otherworldly equilibrium to their lives. We are, Shaantam Resorts one of the best resort in Rishikesh, we have a beautiful physical location at the lap of Lord Shiva (Neelkanth) close to the town of Rishikesh and encompassed by the powerful green Himalayan reaches. Book resort rooms directly from our Official Website.

Reply

Max Turner September 30, 2021 at 6:46 AM

The Webroot program is highly rated software to protect your devices & data available for download at ij.start.canon | ij.start.cannon/ts3322 | Microsoft365.com/setup | microsoft365.com/setup | www.hp.com/go/wirelessprinting

Reply

Max Turner September 30, 2021 at 6:48 AM

Visit ij.start.canon | [ij.start canon](https://ij.start.canon) and find out the best way to download Canon printer drivers. Canon printers are ideal for every situation wherever you need a document, paper, or photo print or even if you wish to scan, fax, and do more ijstart.canon will make you learn how to set up a canon printer to get advanced printing features. To complete your Canon ij printer setup with several connectivity options like WiFi, USB, Bluetooth, and others, see and follow below mentioned steps.

Reply

Max Turner September 30, 2021 at 6:49 AM

Enter Trend micro activation code on www.trendmicro.com/activate | [www.trendmicro/activate](https://www.trendmicro.com/activate) to download and activate Trend Micro. To activate Trend micro, make sure you already have an activation code that you'll probably enter on the trendmicro.com/activate site.

Reply

Airlinesreservation247 October 4, 2021 at 8:50 AM

american airlines flights reservations

american airlines flights reservations

American Airline Flights Reservations

American Airlines Flights Reservations

American Airlines Flights Reservation

American Airline Flights Reservations

Reply



Daniel Coper October 7, 2021 at 6:08 AM

Enjoyed reading your post keep sharing such amazing post will come back to read more.

Regards

office home and student 2019

office.com/setup home & student 2019

fubo.tv/connect

www.fubo.tv/connect

www.primevideo.com/mytv

primevideo.com/mytv

Reply



FlightTripsMart October 13, 2021 at 3:48 AM

Looking for Christmas flight deals? Check out our cheap Christmas Flights and get discounts on cheap airlines flights to your favourite destination! So Hurry up call now (855) 737-7241 & save up to 50%

Christmas Flights Deals

Reply



raj biswas October 21, 2021 at 12:01 PM

Thank you for another excellent article. Where else could anybody get that kind of info in such an ideal way of writing? I've a presentation next week, and I am on the look for such information.

english stories gk quiz app english stories collection story minds

Reply



printerrstart October 29, 2021 at 3:43 AM

Here we suggest an online printer repair service where we have an online support system to manage and installation of the driver by using your model number. If you have any query related to printer, so please contact us via the website - <http://ij.start.canon>

Reply



activate setup November 8, 2021 at 4:05 AM

Canon Pixma MG 2522 is an all-in-one inkjet printer equipped with multifunctional features like printer, scanner, and copier.

Canon.com/ijsetup/mg2522 |

Canon.com/ijsetup mg2522

| camps.intuit.com | camps.intuit.com

Reply



Amenda November 14, 2021 at 3:15 PM

I am very grateful to Dr Dawn Acuna, for bringing back my husband who left me for another woman, that moment my husband Left me I thought I lost everything until a friend of my gave me Dr Dawn Acuna, WhatsApp contact, I messaged her and told her the pain I was going through so she told me that everything was going to be fine that if I have the faith and believe in her that the spell will surely work for me and my husband will surely come back home and she told me what to do, so those things were done and 48 hrs later my husband came back home begging for my forgiveness, am so happy and grateful to Dr Dawn Acuna, if you need her help contact her, she's accurate and sincere,

* If you want spell to conceive.

*If you want to get pregnant.

* If you want to return your lover

*If you want to cure any kind of sickness

* If you need spell to get good job. *If you want to stop having miscarriage. And E.T.C. write her on email { dawnacuna314@gmail.com }

WhatsApp: +2348032246310

Reply



text blogs November 23, 2021 at 12:27 AM

Canon Pixma MG 2522 is an all-in-one inkjet printer equipped with multifunctional features like printer, scanner, and copier.

[Canon.com/ijsetup/mg2522](https://www.canon.com/ijsetup/mg2522) |

[Canon.com/ijsetup mg2522](https://www.canon.com/ijsetup/mg2522)

Reply

Max Turner November 24, 2021 at 2:48 AM

Visit www.hp.com/go/wirelessprinting and open the door to the world of HP smart printing solutions. HP wireless printer is a versatile printing device that helps you print, scan, copy and fax your documents as per the requirement.

Visit ij.start.canon | [ij.start canon](https://ij.start.canon) and find out the best way to download Canon printer drivers. Canon printers are ideal for every situation wherever you need a document, paper, or photo print or even if you wish to scan, fax, and do more ijstart.canon will make you learn how to set up a canon printer to get advanced printing features.

Reply



raj biswas November 25, 2021 at 3:42 PM

it is in reality a correctly-researched content material and high-quality wording.

I got correspondingly engaged in this fabric that I couldnt wait analyzing. i am impressed in the end your positioned it on and skillability. thank you

english stories gk quiz app story minds

Reply



Unknown November 27, 2021 at 2:41 AM

On the web address bar, enter the <https://ij.start.cannon> URL and press Enter key. The [http://ij.start.cannon](https://ij.start.cannon) is a Canon printer drivers download site that offers the latest software and drivers to download on your operating system. [https //ij.start.cannon](https://ij.start.cannon)

If you don't get any cable to connect MG2522 to your PC or laptop, ensure you purchase a USB 2.0 A/B cable. First, visit [canon.com/ijsetup mg2522](https://www.canon.com/ijsetup/mg2522) | [canon.com/ijsetup/mg2522](https://www.canon.com/ijsetup/mg2522)

Reply

[Load more...](#)

[View web version](#)

About Me

Tahmid

I am Syed Tahmid Mahbub, from Dhaka, Bangladesh, born on August 1, 1994. Electronics is my passion and from class V, I have been learning electronics. I learnt and worked mostly on SMPS, power electronics, microcontrollers and integration of microcontrollers with SMPS and power electronics. I've used PIC and AVR microcontrollers - PIC 10F, 12F, 16F, 18F, 24F, dsPIC 30F, 33F, PIC32, ATmega and ATtiny, integrating them with various SMPS and power electronics circuits. I have completed my Bachelor's degree from Cornell University (Class of 2017) in Ithaca, New York, USA, majoring in Electrical and Computer Engineering (ECE). I am a member of the forum www.edaboard.com, where I am an "Advanced Member Level 5" (the highest level attainable) and also the forum allaboutcircuits.com, where I am a "Senior Member". I post to help solve electronics-related problems of engineers and engineering students from all over the world. I love watching and playing cricket and football (soccer), and listening to music. I am now a hardware engineer at Apple in Silicon Valley, California, USA.

[View my complete profile](#)

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