The ProtoTRAK EMX Self-Assessment Guide

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The ProtoTRAK EMX Self-Assessment Guide

Introduction

DRO's were invented almost *four decades* ago.

Your world has changed a lot since then.

People have become more expensive.
Money and **equipment** have become downright *cheap* compared to labor.
The **ProtoTRAK EMX** has brought real simplicity to owning and running a CNC.

These factors add up to one thing: if your shop is running milling machines with DRO's,
this is probably a mistake.

This self-assessment guide helps you to cut through our product claims and see for yourself whether a ProtoTRAK EMX would make a good investment for your shop.

Although written according to generally accepted accounting principles, you won't have to take it to your accountant for help. There are no tricks, no spins, just facts and logic. Go ahead and show it to your accountant when you are finished. He'll approve of the methods and he'll believe the results.

How to Use This Guide

At first glance, the guide seems complicated, but most of the pages are for reference. Simply use the worksheet following this page and fill in the lines with your numbers. If you need help, there are explanations and examples provided in the pages referenced for each line.

Unless you are using this guide to prepare a formal presentation, you should be able to work through it in 20 minutes or so.

The 1970's DRO idea is just not good enough any more.

Do the numbers and see for yourself...

Self-Assessment Worksheet

Hourly Costs of Running a Mill in Your Shop Now (see Page 5)

Explanations & Examples

Line No	Hourly cost of the mill	Enter Your Answer Here	Refer to This Page for Help
1.	Knee mill purchase price. *Include freight, dedicated vice, DRO and power feed, but not consumable tooling.*		5-6
2.	Divide line **1** by 7 years to get the cost per year		5-6
3.	Divide line **2** by 2000 hours per year to get the hourly cost of the mill.		6
	Hourly labor cost		
4.	Hourly wage.		6
5.	Benefits and social security taxes multiplier.		6
6.	Multiply line **4** times line **5.**		6
7.	Add lines **4** and **6** to get hourly labor cost.		6
	Hourly overhead cost		
8.	Hourly overhead multiplier.		7
9.	Multiply line **7** by line **8** to get the hourly overhead cost.		7
10.	Add lines **3**, **7** and **9**. **This is the total hourly cost for running a mill in your shop now.**		7

Cost of Owning a ProtoTRAK EMX (see Page 8)

11.	Purchase price of the ProtoTRAK EMX retrofit or complete machine.		8
12.	If retrofit, enter the knee mill cost from line **1.**		8
13.	Shipping cost.		9
14.	Installation cost.		9
15.	Training cost.		9-10
16.	Lifetime maintenance costs.		10-11
17.	Add lines **11**, **12**, **13**, **14**, **15** and **16** for the cost of owning a ProtoTRAK EMX.		11
18.	Divide line **17** by 7 years to get cost per year.		12
19.	Divide line **18** by 2000 hours per year to get cost per hour.		12
20.	Add lines **7**, **9** and **19**. **This is the total hourly cost for running a mill with a ProtoTRAK EMX.**		12
21.	Subtract line **10** from line **20** for the increase in hourly cost.		12
22.	Divide line **21** by line **10** for the percentage increase in hourly cost.		12
23.	Subtract line **1** from line **17** for the additional costs for buying a ProtoTRAK EMX.		13
24.	Multiply line **7** by (2000 x 7) for the labor cost of the machinist over the life of the ProtoTRAK EMX.		13

Time Savings Assessment (see Page 13)

Unlike costs, which are based on relatively firm numbers, the time savings must be estimated. Use one or all three of the methods below.

		Enter Your Answer Here	Refer to This Page for Help
Method 1 - Guess			
25.	Enter a guess for the amount of time saved over manual machining.	%	13
Method 2 - Comparison Parts			
26.	Comparison Part # 1 time savings.	%	14
27.	Comparison Part # 2 time savings.	%	15
Method 3 - Grading Work for Potential Savings			
28.	Time savings from grading worksheet.	%	16-18
Optional			
29.	Average the numbers on lines **25** through **28**	%	19

The Value of the Time Savings – Hourly (see Page 19)

30.	Enter one of the estimates from lines **25** - **28** or the average from line **29**. *Enter this as a decimal, e.g. 50% = .50*		19
31.	Multiply line **20** by line **30**. This is the value of the time saved per hour.		19

The Value of the Time Savings Over the Life of the ProtoTRAK EMX (see Page 20)

32.	Enter the number of hours per year you estimate using the milling machine with a DRO.		20-21
33.	Multiply line **32** by 7 years for the number of hours over the life of the equipment.		21
34.	Multiply line **33** by line **31** for the value of the time savings over the life of the ProtoTRAK EMX.		21

Time Savings and Earned Shop Rate (see Page 22)

35.	Enter your hourly shop rate.		22
36.	Divide line **35** by (1 – line **30**) for the earned shop rate at the estimated time savings.		22
37.	Subtract line **35** from line **36**. This is the additional profit per (billed) hour from owning a ProtoTRAK EMX.		22

Payback Calculations (see Page 22)

38.	Divide line **23** by line **31** for the number of working hours required to pay for the lifetime cost of the ProtoTRAK EMX.		22-23
39.	Divide line **38** by line **32** for the number of years required to pay for the lifetime cost of the ProtoTRAK EMX.		22-23

40.	Divide line **23** by line **37** for the number of billed hours at your shop rate required to pay the lifetime cost of the ProtoTRAK EMX.		22-23

Comparisons (see Page 23)

1. Total hourly costs of running a mill now and with a ProtoTRAK EMX		
Line **10**=		This is the hourly cost of running a mill in your shop now
Line **20**=		This is the hourly cost of running a mill with a ProtoTRAK EMX.
2. Costs of owning versus value of time saved		
Line **23** =		This is the additional cost of owning a ProtoTRAK EMX.
Line **34** =		This is the value of the time savings of owning a ProtoTRAK EMX.
3. Hourly costs of owning versus hourly value of time saved		
Line **21**=		This is the increase in hourly costs of owning a ProtoTRAK EMX.
Line **31**=		This is the hourly value of the time savings of owning a ProtoTRAK EMX.
4. Cost of the machinist versus the equipment he uses		
Line **24**=		This is the cost of the person standing in front of the mill
Line **17**=		This is the total cost for the piece of equipment he uses.

Now that you've done the hard work, follow through and get that ProtoTRAK EMX on order right away!

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Hourly Costs of Running a Mill in Your Shop Now

You run a machine shop to produce parts. You benefit from investments in productivity equipment like the ProtoTRAK EMX if you can either:

Make more parts with the same cost,
or
make the same number of parts with less cost.

Many people get confused when sorting out costs because what things cost and how they are paid for are different. For example, you may pay for a machine with cash, but the machine didn't "cost" you $10,000 the day you wrote the check and then nothing from then on. Machinists are usually paid by the hour, but benefits like vacation and sick leave are accrued, or earned over weeks or months. The fact that the machinist gets paid to be on vacation means that the parts he makes "cost" you some vacation time.

The trick is to get all the various costs into a common term so that we can compare them. Fortunately, this is pretty easy to do. In this guide, we will calculate all costs by the hour.

The full cost of making parts includes:

- ✓ Material
- ✓ Milling machine
- ✓ Labor
- ✓ Overhead

The amount of material you use per job will be the same whether you use a DRO or a ProtoTRAK EMX. Therefore, we won't worry about it. The other costs above will be calculated by the hour.

Line 1 - Knee Mill Purchase Price

This includes the milling machine, freight in and the price of the power feed, DRO and other equipment used on the mill, but not the consumable tools and coolant. Use the purchase price whether or not the mill is paid for or if it is financed. The financing arrangement has to do with how your company is managing money, not labor or machines. Financing charges are accounted for (simply) in line **8** below.

To keep it simple, we will assume no salvage value (although we are always amazed at what people get for their used ProtoTRAKs).

Line 2 - Divide line **1** by 7 years to get the cost per year.

We assume the mill lasts for seven years, which follows the IRS's rules for depreciation.

Line 3 - Divide line **2** by 2000 to get the hourly cost of the mill.

We assume that there are 2000 working hours per year (50 weeks x 40 hours/week). If you do not use the mill 2000 hours a year, this is still a good number to apply to the hours that you do use it. That is because:

- ✓ If you use the mill more, you will wear it out faster, but it will still cost the same per hour. You've simply compressed the "machine years" into a smaller number of calendar years.

- ✓ If you use it less than full time, the mill will either last you longer or you will be able to sell it for more because it is less worn.

The utilization does matter, of course. We will account for that when we are calculating the value of the time savings in line **32**.

Example
If you bought a new mill with a DRO and power feed for $9,500, the equipment cost per hour would be:

Hourly cost of the mill

1.	Knee mill purchase price *Include freight, dedicated vice, DRO and power feed, but not consumable tooling*	$9500.00
2.	Divide line **1** by 7 years to get the cost per year	$1357.14
3.	Divide line **2** by 2000 to get the hourly cost of the mill	$0.68

Line 4 - Hourly wage.

Pick an hourly wage for a person who runs a milling machine in your shop. If more than one person shares the mill, use an average wage.

Line 5 - Benefits and Social Security tax multiplier.

The labor cost includes benefits and social security taxes. Benefits include breaks, insurance plans, paid sick days, vacation days etc. If you don't have a number already calculated for you by an accountant, 25% of wages is a good guess for most companies. Use a lower number if your company has few benefits and a higher one if you work for a large company or a government agency.

Example
A machinist making $18.00 per hour and typical benefits:

Hourly labor cost

4.	Hourly wage	$18.00
5.	Benefits and social security taxes multiplier	.25
6.	Multiply line **4** times line **5**	$4.50
7.	Add lines **4** and **6** to get hourly labor cost	$22.50

Line 8 - Hourly overhead multiplier.

Overhead is made up of the expenses that don't get used up by the hour or by the job, like tooling and coolant. It is also those expenses needed to run the business that are not directly part of working on a knee mill. This includes things like rent, utilities, telephones, managers, finance charges, invoicing, etc.

Many shops have a burden rate that is applied to the labor rate. Use this number here if you know it. If you don't have an overhead already figured, use this rule of thumb: A low overhead (small company) would be 25% of labor, higher overhead (big company) can be 100% or more.

Note: Many shops put the cost of equipment in the overhead rate. This can be counter-productive because it leads shops to regard equipment as an expense to be controlled, like the rent or electricity. Because equipment has more effect on productivity than most other factors in overhead it deserves the special attention we are giving it in this self-assessment.

Line 9 - Multiply line **7** by line **8** to get the hourly overhead cost.

The rationale behind applying the overhead or burden rate to the labor rate is that more expensive people have higher output and use up more stuff. It is a good assumption.

Example
To be conservative, we will use the labor rate calculated above to figure overhead in a small job shop:

8.	Hourly overhead multiplier	.25
9.	Multiply line **7** by line **8** to get the hourly overhead cost	22.50 x .25 = $5.63

Line 10 - The total hourly cost for running a mill in your shop now.

Example
Now that each of the parts is calculated, we can use our examples above to figure out the entire cost of running a knee mill per hour:

10.	Add lines **3**, **7** and **9**. **This is the total hourly cost for running a mill in your shop now.**	0.68 + 22.50 + 5.63 = $ 28.81

On a yearly basis, this is a cost of 2000 hours/year x $28.81 / hour = $57,620.00. Only about $1360.00 of that came from the cost of the equipment. The majority of the cost was from labor and overhead.

Cost of Owning a ProtoTRAK EMX

Line 11 - Purchase price of the ProtoTRAK EMX retrofit or complete machine**.**

You may purchase a ProtoTRAK EMX in three ways:

- ✓ As a retrofit to a mill you already own.
- ✓ On a TRAK mill.
- ✓ Retrofit by a dealer to a mill of another brand.

A word about retrofitting: there is no reason to retire a milling machine in good condition in order to buy a ProtoTRAK EMX. Retrofitting is highly recommended for shops that have mills that are less than 3 years old, or even older if they receive little use. When the milling machine wears out, you can put the ProtoTRAK EMX on another one.

Line 12 - If retrofit, enter the knee mill cost from line **1**.

If you will retrofit to a mill in your shop, you must still account for the cost of the mill even though you don't have to buy one. It does not matter how old the mill is or whether or not it is paid for. We are looking to calculate costs per hour, and costs are incurred as the mill is used up, not when it is purchased.

You should leave the cost of the DRO and power feed on the original machine purchase price, even though they are going into the garbage. It is a "sunk cost" that you can't do anything about but promise yourself to do better next time.

Examples

1. The ProtoTRAK EMX is purchased as a retrofit for the machine in the previous examples.

11.	Purchase price of the ProtoTRAK EMX retrofit or complete machine	$7995.00
12.	If retrofit, enter the knee mill cost from line **1**	$9500.00

2. The ProtoTRAK EMX is purchased as part of one of the fine knee mills offered by Southwestern Industries.

11.	Purchase price of the ProtoTRAK EMX retrofit or complete machine	$15,995.00
12.	If retrofit, enter the knee mill cost from line **1**	$ 0.00

Line 13 - Shipping cost.

In the US, shipping via truck line will be:

		Retrofit Kit	Machine
West Coast USA	=	$200.00	$700.00
Middle USA	=	$275.00	$1100.00
East Coast USA	=	$300.00	$1300.00

For Canada, Mexico and Europe, get a quote from the local authorized distributor. The retrofit ProtoTRAK EMX may also be shipped via UPS for quicker delivery.

Line 14 - Installation cost.

The ProtoTRAK EMX comes with a self-installation manual. A skilled machinist could install a ProtoTRAK EMX in about 4 to 6 hours in most cases. In most parts of North America and Europe, installation is available from SWI or an authorized distributor for a small price.

Installation Charges Worksheet

Option 1 - Self-Installation	
Number of hours estimated (use 5 to guess) =	
Times the hourly labor cost from line **7**	x
Self-Installation cost =	

Option 2 - Paid Installation from SWI or Authorized Distributor	
Quoted Installation Charge =	

Example

The ProtoTRAK EMX is installed by a maintenance man in the shop who has some experience working on knee mills:

Option 1 - Self-Installation	
Number of hours required =	5
Times the hourly labor cost from line **7**	$22.50
Self-Installation cost =	$112.50

Line 15 - Training cost.

The ProtoTRAK EMX comes with a self-training turtorial that most machinists can complete in two hours. In most parts of the North America and Europe, training is available from SWI or an authorized distributor for a small price. In addition to the formal training time, it will take the operator a few days of slightly slower operation in order to get accustomed to working with a ProtoTRAK EMX. In case the ProtoTRAK EMX will be run by one of the tens of thousands of people who already know how to run a ProtoTRAK or TRAK CNC, the training cost will be very near $0.00.

Training Cost Worksheet

Option 1 - Self-Trained	
Hours estimated initial training (use 3 to guess) =	
Plus 3 days at 75% productivity (costs 25% of the day)	+ 3 x 8 x .25 = 6
Equals hours "spent" on training =	
Times the hourly labor cost from line **7**	x
Equals the training cost =	

Option 2 - Purchased Training	
Hours in initial training (probably 2) =	
+ 1 day at 75% productivity	+ 1 x 8 x .25 = 2
Equals hours "spent" on training =	
Times the hourly labor cost from line **7**	x
Plus the quoted training fee[1]	+
Equals the training cost =	

Example
The self-training guide is used by a manual machinist to learn the ProtoTRAK EMX on his own:

Option 1 - Self-Trained	
Hours estimated initial training (use 3 to guess) =	3
Plus 3 days at 75% productivity (costs 25% of the day)	+ 3 x 8 x .25 = 6
Equals hours "spent" on training =	9
Times the hourly labor cost from line **7**	x 22.50
Equals the training cost =	$202.50

Line 16 - Lifetime maintenance costs.

The ProtoTRAK EMX is precision technology equipment and it is almost certain to require spare parts and service over its lifetime (this is the mill lifetime used in this self-assessment guide, 7 years). SWI has kept the service costs to an absolute minimum with the following measures:

- ✓ **Design**. The ProtoTRAK EMX consists of few components so there is very little to go wrong.
- ✓ **Modular Components**. All of the electrical components are in modules that are easy to trouble-shoot and replace.
- ✓ **Self-Service**. An illustrated self-service manual is included with every ProtoTRAK EMX. Our warranty and exchange policy explicitly covers the damage done to our parts for mistakes made in self-service. Additional technical support is available through the web site or our toll-free service department phone number.

[1] SWI factory-direct sales and many distributors include training along with the installation price of $500. You would put $0 here.

- ✓ **Exchanges**. SWI maintains a stock of quality, rebuilt parts in fully-tested, like-new condition to be exchanged for failed components. This makes the solution to the problem a fraction of the cost it would be to replace with a new part. See your SWI representative for a list of prices for service parts.

A reasonable estimation for *lifetime* service parts and labor costs would be $1000. This covers the replacement of one or two major components. Be sure to deduct the cost of the maintenance and service for the DRO and power feed you will not need.

Maintenance Worksheet	
Service and maintenance costs estimated =	
Minus DRO and power feed maintenance costs	-
Equals the estimated lifetime service costs =	

Example
The maintenance costs for a system that had a computer module fail out of warranty in the fourth year that was replaced without a service call with SWI's unique self-service program. We will also subtract our estimation of the cost of one part replacement and service call for the DRO that we would have had to pay, but didn't.

Service and maintenance costs estimated =	500.00
Minus DRO and power feed maintenance costs	- 250.00
Equals the estimated lifetime service costs =	$250.00

Line 17 - Total lines **11**, **12**, **13**, **14**, **15** and **16** for the cost of owning a ProtoTRAK EMX.

Example
The typical cost to a shop of buying a ProtoTRAK EMX as a retrofit and throwing the DRO and power feed that were on the machine in the garbage.

11.	Purchase price of the ProtoTRAK EMX retrofit or complete machine	7995.00
12.	If retrofit, enter the knee mill cost from line **1**	9500.00
13.	Shipping cost	300.00
14.	Installation cost	112.50
15.	Training cost	202.50
16.	Lifetime maintenance costs	250.00
17.	Total lines **11**, **12**, **13**, **14**, **15** and **16** for the cost of a mill with a ProtoTRAK EMX	$18360.00

Lines 18 and 19. - Divide by 7 and then by 2000 to get cost per hour.

This is the same thing we did to get the mill cost per hour for the milling machine before the ProtoTRAK EMX is added.

Example

18.	Divide line **17** by **7** to get cost per year	$2622.86
19.	Divide line **18** by 2000 to get cost per hour	$ 1.31

Line 20 - Total lines **7**, **9** and **19**.

We add our new machine hourly cost with the overhead and labor hourly costs to come up with the total hourly cost for running the mill with a ProtoTRAK EMX.

Example

20.	Total lines **7**, **9** and **19**. **This is the total hourly cost for running a mill with a ProtoTRAK EMX.**	22.50 + 5.63 + 1.31 = $29.44

Line 21 - Subtract line **10** from line **20** for the increase in hourly cost.

Line **10** is the total hourly cost for running the machine with a DRO. Line **20** is the cost for running a machine with a ProtoTRAK EMX. This will show how much extra it costs an hour to run the machine with a ProtoTRAK EMX.

Line 22 - Divide line **21** by line **10** for the percentage increase in hourly cost.

The percentage increase in cost is calculated by the formula: (new cost - old cost) ÷ old cost. This will show how much more the ProtoTRAK EMX costs and really puts it into perspective. Most people are amazed to see how little it increases overall costs to buy the ProtoTRAK EMX. That is because most of the costs of running a milling machine are not in the equipment, they are in the labor and overhead.

Example

In this example, the cost of running a knee mill has gone up by 2% as a result of purchasing a ProtoTRAK EMX.

21.	Subtract line **10** from line **20** for the increase in hourly cost	29.44 - 28.81 = $0.63
22.	Divide line **21** by line **10** for the percentage increase in hourly cost	0.63 ÷ 28.81 = .02 or 2 %

If the productivity can be raised by just 2%, the investment is a break-even!

Line 23 - Subtract line **1** from line **17** for the additional costs of buying a ProtoTRAK EMX.

The cost of the mill you are using now needs to be deducted from the cost of the mill with the ProtoTRAK EMX so that you can isolate the additional costs for the purchase of the ProtoTRAK EMX.

Line 24 - Multiply line **7** by 2000 x 7 for the labor cost of the machinist over the life of the ProtoTRAK EMX.

To go from hourly cost to the cost of the labor over the life of the ProtoTRAK EMX, we multiply times the number of hours per year (2000) and by the number of years (7). This is a conservative life for the ProtoTRAK EMX. SWI supports products long past seven years. For proof, consider that most of the original ProtoTRAK's sold in the mid to late '80s are still eligible for exchanges from our excellent Express Exchange Program.

Example

23.	Subtract line **1** from line **17** for the additional costs for buying a ProtoTRAK EMX.	18,360 - 9500 = $8860.00
24.	Multiply line **7** by (2000 x 7) for the labor cost of the machinist over the life of the ProtoTRAK EMX (not including overhead).	22.50 x 2000 x 7 = $315,000.00

Time Savings Assessment

In the previous section, you will have shown an increase in the cost of running your mill as a result of buying a more expensive piece of equipment. If this were the end of the story, you would not want to buy a ProtoTRAK EMX because it will cost you more to run the mill that way.

That is not the end of the story, however, because you use that mill plus labor to make parts and the number of parts you make for the labor you spend is important.

So, the question is, can you make *enough* additional parts with the same labor, or save *enough* time on the same number of parts to cover the cost of the ProtoTRAK EMX?

Method 1 - Guess

There are tens of thousands of ProtoTRAK's and other TRAK CNC's made by SWI in machine shops all over the developed world. So this information is definitely out there. You probably know someone who uses one. In fact, if you have a friend who you know uses a ProtoTRAK and he hasn't tried to get you to buy one, get another friend. This one doesn't really like you.

Line 25 - Enter a guess for the amount of time saved over manual machining.

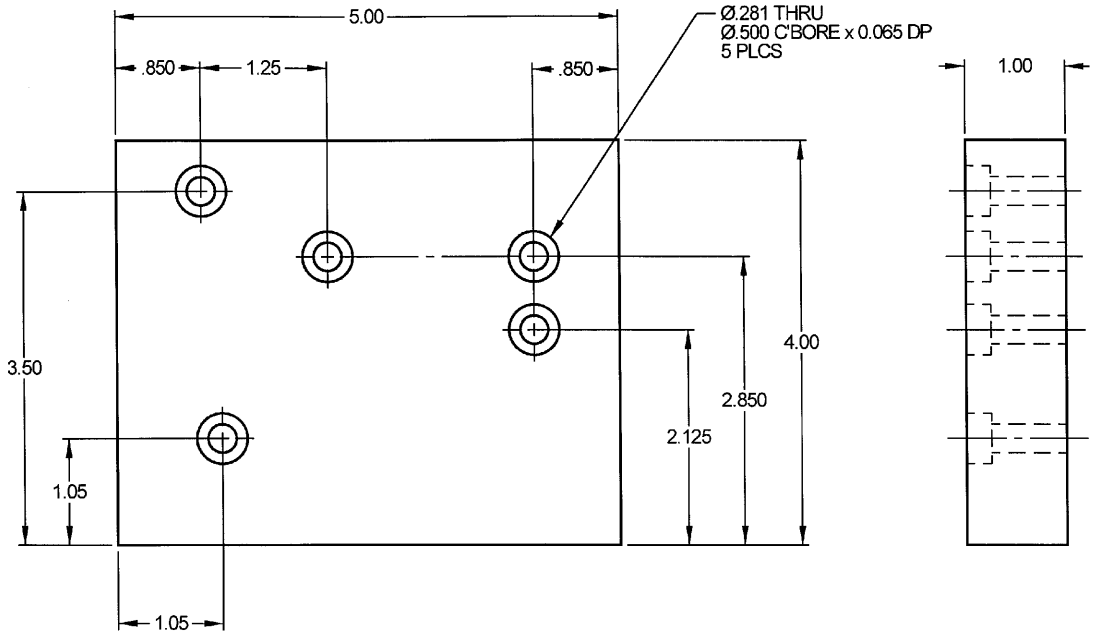
You can ask someone who uses one, or just think up a number and put it in.

Method 2 - Comparison Parts

This method involves some work, but can be very precise. You may want to machine the comparison parts below and keep track of your time or you could just look at the parts, estimate what it would take you to machine them, and then fill in the worksheet.

A semi-skilled operator using a ProtoTRAK EMX while being timed machined the following parts. The 5" x 5" x 1" aluminum blocks were held in a vise.

Line 26. - Comparison Part # 1 time savings.

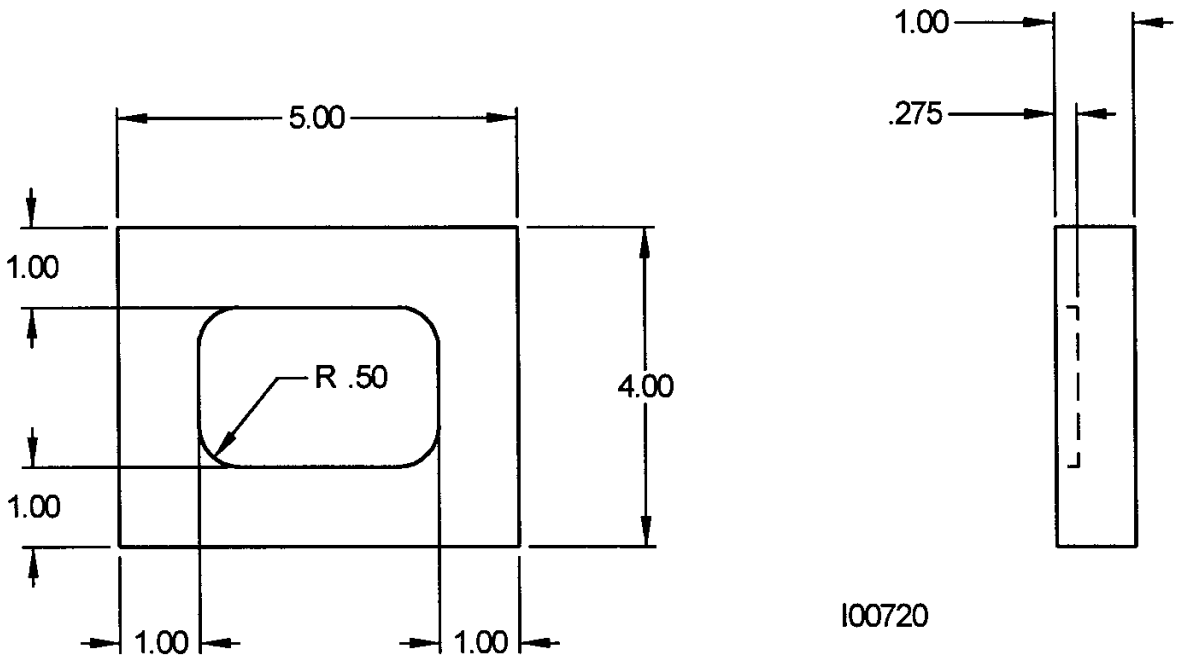


Time used on this job:

Set-up – put the part in the vise and establish the DRO 0,0 position (min:sec) = 5:00.
Time required to program = 1:52
Time machining (3 tools used) = 2:48
Total time = 9:40 min = .16 hour

	Your numbers	Example
Your time to make the part =		= .42
Minus our time to make the part =	– .16 hour	– .16 hour
The time savings =		= .26
÷ your time to make the part		÷ .42
= the percentage savings – enter into line **26**		= .62 or 62%

Line 27 - Comparison Part #2 time savings.



Set-up: put the part in the vise and establish the DRO 0,0 position (min:sec) = 5:00.
Time required to program (min:sec) = 0:37
Time machining = 3:36
Total time = 9:13 min = .15 hour

Note: since the pocket is machined at a single depth, the operator can be doing something else while the part is being cut. This reduces the time spent by the expensive person even more.

To figure your own possible time savings and the effect on your costs, use the following worksheet:

	Your numbers	**Example**
Your time to make the part =		= 1.2
Minus our time to make the part =	– .15 hour	– .15 hour
The time savings =		= 1.05
÷ your time to make the part		÷ 1.2
= the percentage savings		= .875 or 87.5 %

Method 3 - Grading Work for Potential Savings

To get a rough idea of the time savings you may realize, compare the work you do on your mills now with the potential time savings on the chart below.

Time Savings by Type of Operation

Type of Operation	How the Saving Comes About	Time Savings
Drilling Holes	For each hole, the ProtoTRAK EMX moves to position at 100 IPM. If you have holes that are an inch or so apart, the ProtoTRAK EMX will move to the next one in about one second. This saves an average of 20 or more seconds per position per tool.	**1 part – 10 - 20%** **2 - 10 parts – 20 - 30 %** **10 - 50 parts – 30 - 70%** - Use small multipliers if you use one tool or only one hole. - Use larger ones for multiple holes or tools.
Bolt Hole Patterns	The ProtoTRAK EMX automatically figures the position of each hole from the simple data you enter from the print. This saves the positioning time as shown above plus 3 - 5 minutes per hole calculating hole positions.	**1 part – 30 - 50 %** **2 - 10 parts – 30 - 60 %** **10 - 50 parts – 50 - 70%** - Use larger multipliers for multiple holes.
Straight Milling to Dimension	The ProtoTRAK EMX figures tool path from the simple data you enter, saving positioning and touching off tools. Diagonals are machined without a special set-up. Critical dimensions or surfaces can be machined with finish cuts.	**Each part – 30 to 50%** - Use large multiplier if diagonals.
Straight Milling Dimensions Don't Matter (e.g., flycutting)	Little or no savings if you already have a power feed.	None
Blending Radii on Straight Cuts	A tedious and error-prone process for manual machining, it is a single data input for the ProtoTRAK EMX. It machines straight through radii without a pause saving 3-5 minutes for each radius for which you have the correct diameter mill (or drill), 30 minutes for each radius for which you do not.	**Each part – 50 to 70%** - Use smaller multiplier for one radii, use larger for multiple.
Arc Machining	This is so hard to do manually you may even send every part with an arc to a CNC. Saves the rotary table set-up.	**90% of set-up time.** **Plus 35 – 50% cutting time**
Pockets (Roughing Material)	Pockets are machined automatically with removal of all the material in the middle and finish cuts. Multiple passes at different depths are easy. This often saves all the machining time since the operator can be doing something else as the cutter works its way through the material.	**50 to 75%** - Use large multiplier if job lends itself to untended operation – i.e. large work piece or tough material. - Add to above if contouring is required.

Line 28 - Time savings from grading worksheet.

The grading method above can be used for mills that do a variety of work by estimating the amount of time the mill is used in a particular operation (when it is used) and then applying the time savings for that operation as suggested in the chart above. Below are three examples and then a worksheet for you to calculate your own numbers for the way your shop uses the mill.

Example

This example is for a knee mill that is used almost exclusively for drilling holes and squaring blocks. It is also used a couple of times a week cutting slots. The lot sizes range from 10 to 20.

Type of operation	% time used in this operation	X	% estimated time savings	=	% total time saved
Drilling	45	X	35	=	15.75
Squaring Blocks	45	X	0	=	0
Cutting Slots	10	X	40	=	4
	100%		Total	=	19.75%

Even for this simple case, having a ProtoTRAK EMX saves almost 20% of the operator's time in front of this mill.

Example

A knee mill that is used in prototyping and engineering support. A lot of variety in the parts and contouring is not uncommon. Frequent rework of prototype parts or minor changes to drawings for remake of parts is required.

Type of operation	% time used in this operation	X	% estimated time savings	=	% total time saved
Drilling	15	X	15	=	2.25
Bolt Hole Drilling	10	X	40		4.0
Squaring Blocks	15	X	0	=	0
Straight Milling	25	X	35	=	8.75
Blending Radii	25	X	50		12.5
Arc Milling	10	X	75		7.5
	100%		Total	=	35%

Example
A tool and die support machine used exclusively for drilling holes and milling out pockets with blended radii.

Type of operation	% time used in this operation	X	% estimated time savings	=	% total time saved
drilling	60	X	20	=	18
Pocket milling	40	X	80		32
	100%		Total	=	50%

Grading your work for potential savings. Worksheet.

Enter the total in line **28**.

Type of Operation	**% time used in this operation**	**X**	**% estimated time savings for this operation**	**=**	**% total time saved for this operation**
Drilling - Single Parts		X		=	
Drilling – Multiple Parts		X		=	
Bolt Hole Drilling		X		=	
Straight Milling to Dimension		X		=	
Fly Cutting		X		=	
Blending Radii		X		=	
Setting up for arc Machining		X		=	
Arc Machining		X		=	
Pocket Milling		X		=	
		X		=	
	100%		Total	=	*Enter total in line **28***

Line 29 - Average the numbers on lines **25** through **28**.

If you have used more than one method to come up with estimates for time savings, you may want to average them here.

Example

The following estimations were calculated and then averaged on line ***29****.*

Method 1 - Guess.

25.	Enter a guess for the amount of time saved over manual machining.	50 %

Method 2 - Comparison Parts

26.	Comparison Part # 1 time savings.	62 %
27.	Comparison Part # 2 time savings.	87.5 %

Method 3 - Grading Work for Potential Savings

28.	Time savings from grading worksheet.	50 %
29.	Average the numbers on lines **25** through **28**	50 + 62 + 87.5 + 50 = 249.5 ÷ 4 = 62 %

Line 30 - Enter one of the estimates from lines **25-28** or the average from line **29**.

Choose between one of the estimates or the average.

The Value of the Time Savings - Hourly

Line 31 - Multiply line **20** by line **30**. This is the value of the time saved per hour.

Valuing time this way assumes that there is something to do with the time that is of the same value as the time being saved.

Use the number on line **20** in order to show the value for the new, higher cost of owning a ProtoTRAK EMX.

Example

30.	Enter one of the estimates from lines **25** - **28** or the average from line **29**. *Enter this as a decimal, e.g. 50% = .50*	.62
31.	Multiply line **20** by line **30**. This is the value of the time saved per hour.	29.44 x .62 = $18.25

The Value of the Time Savings Over the Life of the ProtoTRAK EMX

We calculate the value of timesavings over the life of the ProtoTRAK EMX because it makes a good comparison with the lump of money that you have to pay. In more sophisticated methods of financial analysis (the kind that put you to sleep) the money that is expected in the future is discounted, or reduced, to reflect the time value of money – that is the fact that a dollar you have today is worth more than a dollar you expect in the future. We don't attempt to do this because the thing we are valuing – time, is just as likely to go up in value as the value of money will increase. In other words, the cost of labor will rise as fast or faster than the cost of money. This expectation offsets the time value of the money.

Line 32 - Enter the number of hours per year you estimate using the milling machine with a DRO.

In previous sections we had you calculate costs on an hourly basis without regard to how much you use the milling machine. In this line, we account for your expectation of the utilization for the machine. We make this estimate based on the slow, inefficient DRO you are using now, because the value of the timesavings comes from eliminating labor and overhead by investing in the ProtoTRAK EMX.

As a rule of thumb, there are 2000 working hours per year. If your mill is used only half the time, you should enter 1000 here. If your company works a lot of overtime or multiple shifts, the 2000 hours per year can be much higher. If the operator is not cranking the handles, but is setting up, making calculations, planning, or doing bench work to prepare to use the machine, include this time in your estimate. Using the ProtoTRAK EMX will save much of this set-up time.

When utilization is less than 75%, it is easy to make a fundamental logical error: the mill isn't used all the time, so it is not worth any investment at all. This is a harmful conclusion because even if your shop doesn't use the machine all the time, this is still not a good reason to use it inefficiently when it is used. Poor productivity costs you a lot of money everywhere it occurs. It is easy to correct for this error in logic if you do one of two things.

1. Reduce the cost of the machine by subtracting a resale value in line **17**. It is not unusual for a used ProtoTRAK on a milling machine to fetch half of its original selling price. This is no accident. We do a great job of supporting past generations (unlike our competitors) in order to keep the resale value high. We also make good money on service parts, and that is why we stay in the business of making service parts.

2. Increase the number of years of life in line **33** from seven to ten or even more. SWI's commitment to service and parts means that you can count on keeping the machine running at a reasonable cost for at least ten years after you purchase it. We have a 40-year record that proves this commitment.

If your shop has a knee mill with a DRO that is hardly used, your people should be commended for their good sense. They know that mill is under-equipped. You can't blame people for avoiding it because theyknow it wastes a lot of time. The trouble is, unless you have a ProtoTRAK, there aren't really good choices for how to do small lot work efficiently. Some shops put *everything* on a machining center. That can waste

more time than working with a manual machine, but people feel better about it because at least they are using technology.

Get a ProtoTRAK EMX, and you will be surprised at how useful this simple, versatile tool will be. People will start putting some jobs on the ProtoTRAK EMX in preference to the machining center because it is just more efficient. Many shops around the world know what it means when a job is a "ProtoTRAK job". It will profit your shop to find out what this means, too.

Line 33 - Multiply line **32** by 7 years for the number of hours over the life of the equipment.

We use seven years, as before, because this is the number of years the IRS has us depreciate the equipment. If you use the mill intensively, you may wear it out faster. Your number of hours per year in line **32** should be higher. If you use the mill lightly, increase the number of years or subtract a resale value from line **17**.

Line 34 - Multiply line **33** by line **31** for the value of the time savings over the life of the ProtoTRAK EMX.

Examples

Consider below a job shop with a lot of milling work so the mill is used consistently 30 hours a week.

32.	Enter the number of hours per year you estimate using the milling machine with the ProtoTRAK EMX.	30 x 52 weeks = 1560
33.	Multiply line **32** by **7** for the number of hours over the life of the ProtoTRAK EMX.	1560 x 7 = 10920
34.	Multiply line **33** by line **31** for the value of the time savings over the life of the ProtoTRAK EMX.	$18.17 x 10920 = $198,416.00

And below consider a support shop that expects to use the ProtoTRAK EMX about half the time.

32.	Enter the number of hours per year you estimate using the milling machine with the ProtoTRAK EMX.	20 x 52 weeks = 1040
33.	Multiply line **32** by **7** for the number of hours over the life of the ProtoTRAK EMX.	1040 x 7 = 7280
34.	Multiply line **33** by line **31** for the value of the time savings over the life of the ProtoTRAK EMX.	$18.70 x 7280 = $132,227.60

The numbers in the above examples may seem almost unbelievable, but consider this. Over the course of the next seven years, a skilled person in your shop is going to cost you something like $393,750.00[2]. Find a way to save just 2% of his time, and you have paid for a ProtoTRAK EMX. If he goes anywhere near a milling machine on a regular basis, saving 2% of his overall time when you have a ProtoTRAK EMX is pretty well assured.

[2] Calculated as: hourly wage = $18 / hour, social security and benefits = 25%, overhead = 25%, times 2000 hours per year times 7 years.

Time Savings and Earned Shop Rate

If you are in the job shop business, you may want to estimate the effect the ProtoTRAK EMX will have on the profitability of each billed hour. Many shops have a billing rate that they apply when estimating a job. When the job is completed, an earned shop rate is calculated. This section will show the increase in profitability per hour billed and compare it to the increase in cost.

Example

35.	Enter your hourly shop rate.	$60.00
36.	Divide line **35** by (1 - line **30**) for the earned shop rate at the estimated time savings.	$60.00 ÷ (1 - .62) = $157.89
37.	Subtract line **35** from line **36**. This is the additional profit per (billed) hour from owning a ProtoTRAK EMX.	$97.89

Payback Calculations

Another way to look at an investment is to calculate how long it will take to get your money back.

Line 38 - Divide line **23** by line **31** for the number of hours to recover the lifetime cost of the ProtoTRAK EMX.

We divide the total additional cost for the ProtoTRAK EMX on line **23** by the value for the time savings per hour. This gives us the number of hours that the mill must be used to get back the investment on the ProtoTRAK EMX. Once the ProtoTRAK EMX is used for this number of hours, the rest of the time the ProtoTRAK EMX saves is pure gain.

Line 39 - Divide line **38** by line **32** for the number of years required to pay for the lifetime cost of the ProtoTRAK EMX.

The number of hours is calculated in terms of years to give you an idea of the amount of time that has to go by before the ProtoTRAK EMX is paid for.

Line 40 - Divide line **23** by line **37** for the number of billed hours at your shop rate required to pay the lifetime cost of the ProtoTRAK EMX.

If you are a job shop or use shop rates to track costs, this will give you an idea of how much work you have to get for the machine in order to break even on the lifetime costs of the ProtoTRAK EMX.

Example

38.	Divide line **23** by line **31** for the number of working hours required to pay for the lifetime cost of the ProtoTRAK EMX.	$8860 ÷ $18.25 = 485 hours
39.	Divide line **38** by line **32** for the number of years required to pay for the lifetime cost of the ProtoTRAK EMX.	485 ÷ 1560 = .31 year or around 3.7 months
40.	Divide line **23** by line **37** for the number of billed hours at your shop rate required to pay the lifetime cost of the ProtoTRAK EMX.	$8860 ÷ $97.89 = 90 hours

Comparisons

1. **Total hourly costs of running a mill now and with a ProtoTRAK EMX.**
   On an hourly basis, the difference in cost is trivial. You are probably spending more per hour on coffee than this (not to belittle the value of coffee, mind you). With labor costs high and rising, it is not hard to see why even a small improvement in productivity completely overwhelms the insignificant increase in costs.

2. **Costs of owning versus value of time saved.**
   If the value of lifetime savings of owning the ProtoTRAK EMX is greater than the lifetime costs of owning a ProtoTRAK EMX, then you will be richer for having a ProtoTRAK EMX. If the difference is a lot, you should get a ProtoTRAK EMX immediately. If the difference is a little, you should probably get one anyway. Just how long are you going to stick with 1960's technology, anyway?

3. **Hourly costs of owning versus hourly value of time saved.**
   In case you are concerned with the long time horizon of seven years, this will help you to see the picture in smaller time intervals.

4. **Cost of the machinist versus the equipment he uses.**
   We put this in here for a little bit of perspective. Too many shops try to save money by economizing on equipment. But the cost of equipment is almost laughable compared to the cost of labor. If you want to save money, you are much better off doing what you can to lower the big number. Reducing an expense that is already small is hard, reducing one that is large has more potential. That is what an investment in the ProtoTRAK EMX is all about – making the big number smaller per part machined.