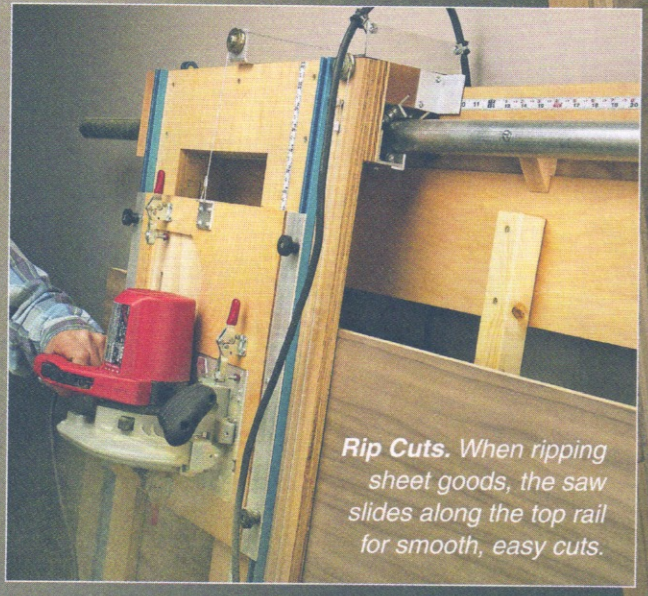
dream shop
project

sliding-carriage Panel Saw

It's the hassle-free way to cut plywood. And it has features that will save you time and money.

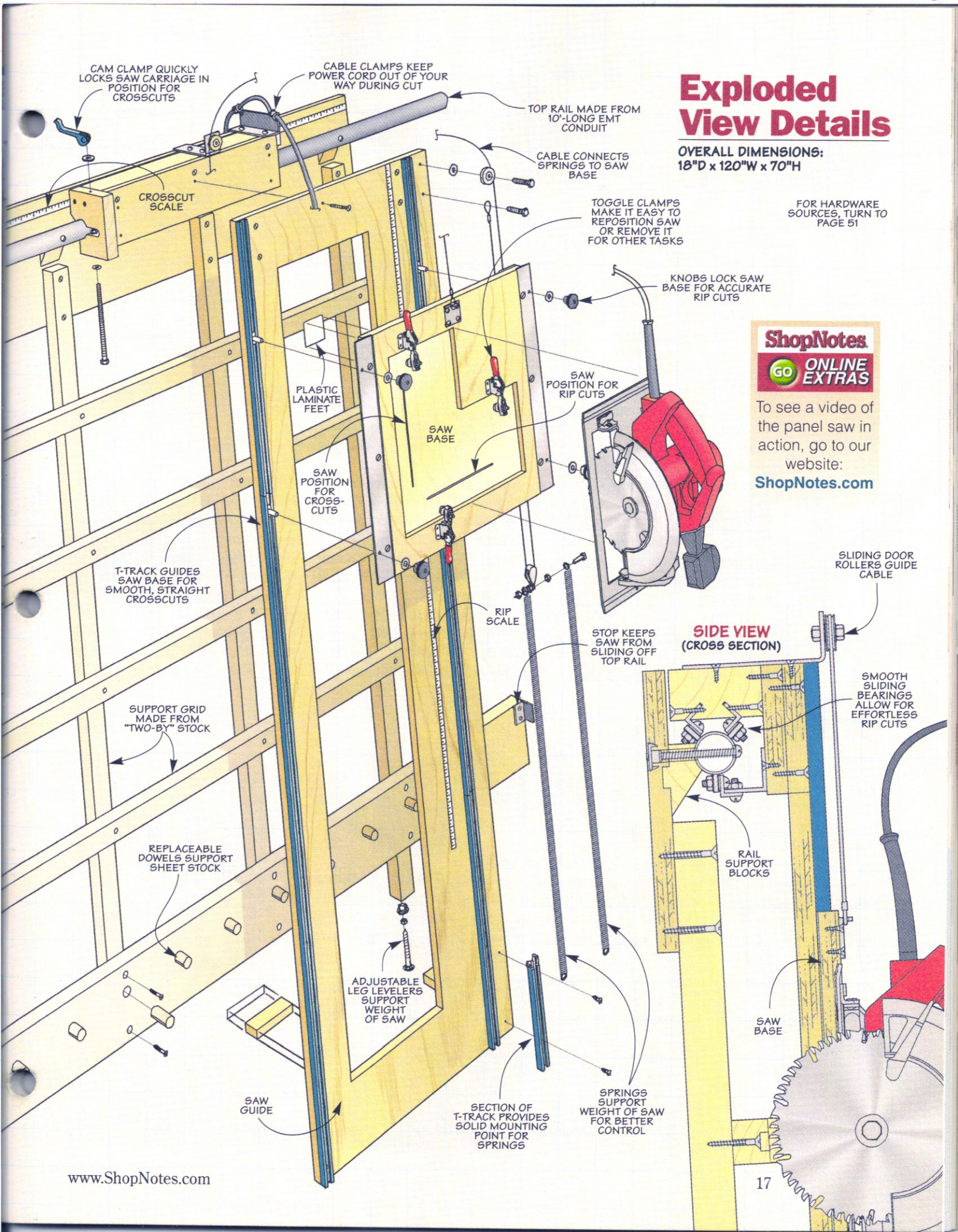


Rip Cuts. *When ripping sheet goods, the saw slides along the top rail for smooth, easy cuts.*

An easy way to break down sheets of plywood is on a panel saw. The trouble is, these saws can cost a thousand dollars or more. But besides cost, most panel saws take up a lot of wall space. That's because the saw carriage is fixed, so you need ample room to load and unload the panel. And for ripping, that means you'll need a full 8' on both the "infeed" and "outfeed" side of the saw.

But the panel saw you see here solves both of these problems. First of all, you'll save a lot of money by building the saw yourself. (Ours cost less than $350, without the circular saw.)

And second, once the sheet of plywood is in place, it never moves. Instead, a sliding carriage guides the circular saw so you can make both rip and crosscuts accurately.



Exploded View Details

OVERALL DIMENSIONS:
18"D x 120"W x 70"H

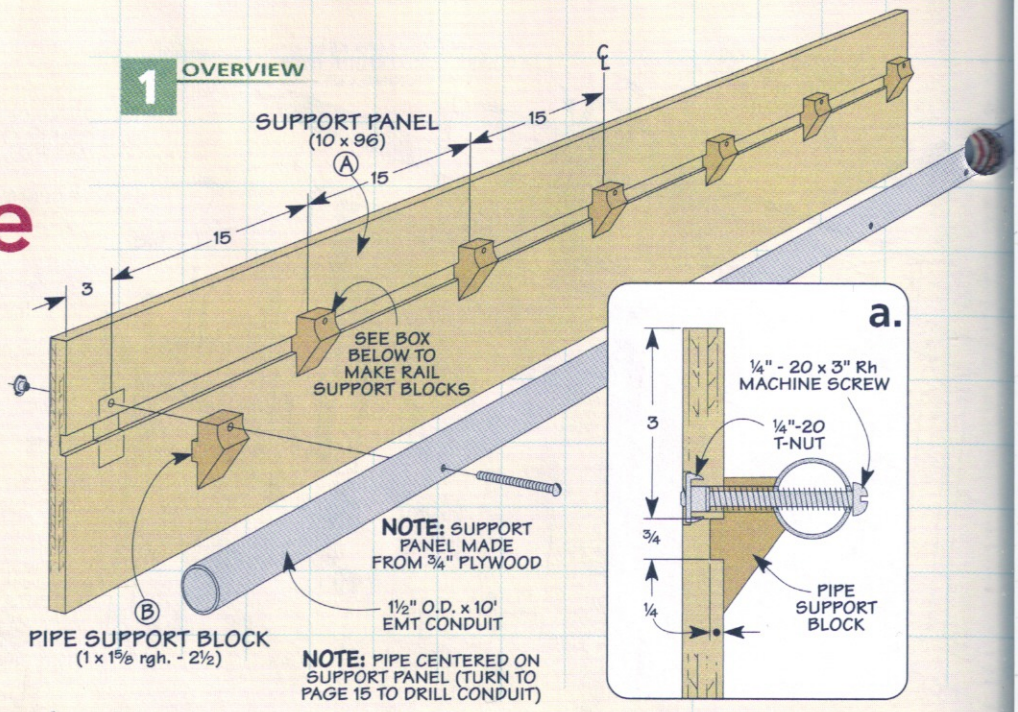
FOR HARDWARE SOURCES, TURN TO PAGE 51

ShopNotes GO ONLINE EXTRAS

To see a video of the panel saw in action, go to our website:
ShopNotes.com

building the

Panel Saw Base



Tackling a project the size of a panel saw may seem a little daunting at first. A great way to make it more manageable is to break it down into sections. That's what you see here. This way, you can use each section to build on the next.

I started by building the fixed portions: an upper assembly that guides the saw carriage and a lower one that cradles the panel.

CARRIAGE SUPPORT ASSEMBLY

The first section to build is the upper portion of the panel saw that supports the sliding saw carriage. The carriage will ride on a 10'-length of EMT conduit, as you can see in Figure 1. This rail is supported by a long plywood panel and a handful of hardwood rail support blocks.

Although the construction isn't complicated, what's important is making sure the finished assembly is as flat and straight as possible. So I took a little extra time to find the flattest sheet of plywood to make the support panel.

After sizing the panel, I needed a way to align the support blocks perfectly. To do this, there's a groove cut in the support panel.

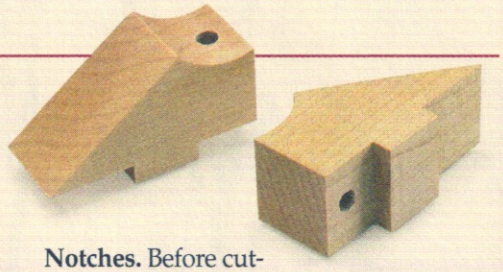
Support Blocks. As for the blocks, they're shaped to securely anchor the conduit but not get in the way of the saw carriage. You'll find all the details you need to make these parts in the box below.

Attaching the Rail. After completing the blocks, you're nearly ready for assembly. All that's left is to predrill the rail. The setup I used to drill the rail is shown on page 15.

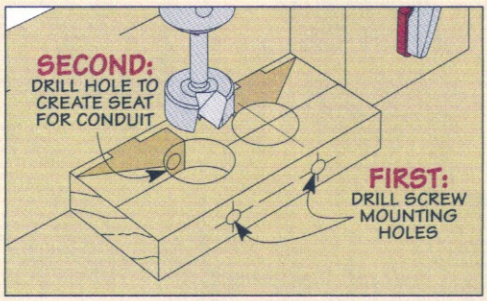
Rail Support Blocks

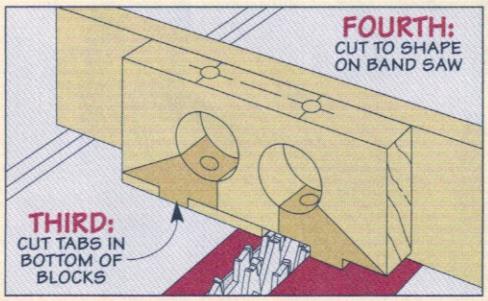
The blocks that support the long piece of conduit are pretty simple. The only thing is you want to make sure they're identical.

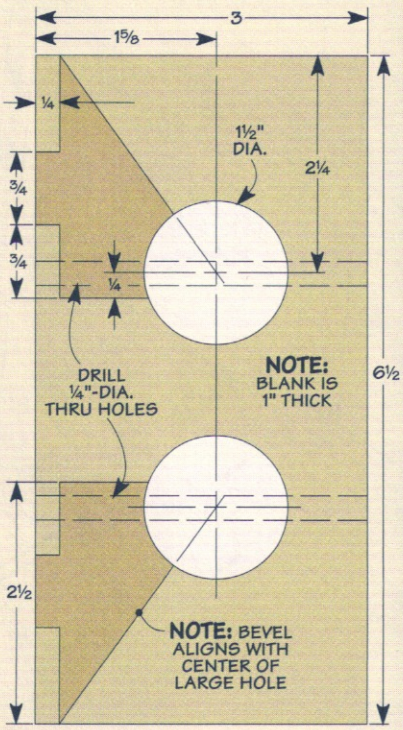
Two at a Time. I made the blocks from an oversize blank, as you can see at right. The larger blank is easier to control. The first thing to do is drill the mounting holes. Then you can drill a couple of larger holes to create the "seats" for the conduit. To do this accurately, I set up a fence and stop block on my drill press (left drawing below).

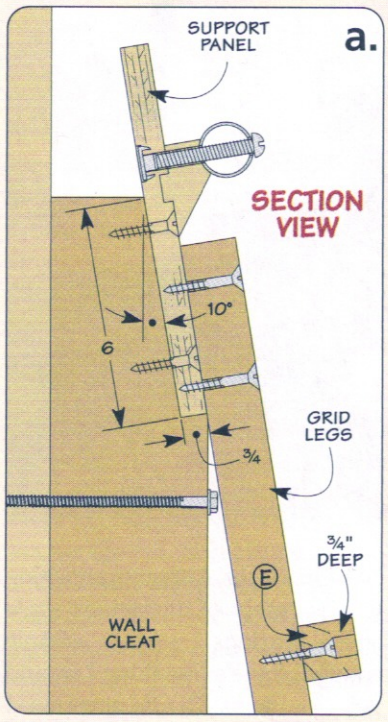


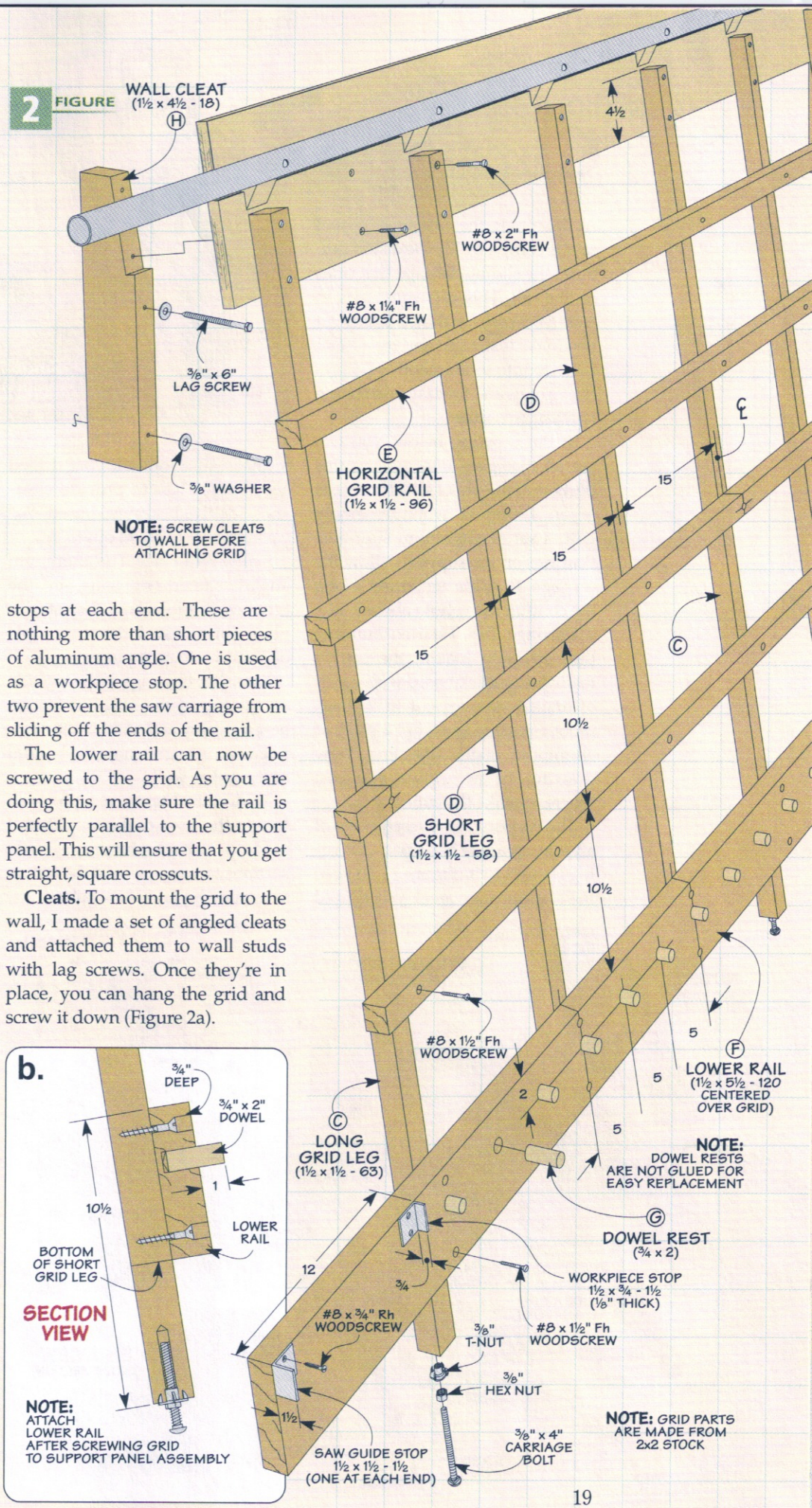
Notches. Before cutting the blocks to shape, I took the blank over to the table saw and cut notches along the bottom edge to create tabs to fit the groove in the support panel (right drawing below). Then I cut the blocks to shape on the band saw.











Then, I used T-nuts and machine screws to hold everything together.

PANEL SUPPORT GRID

The upper assembly you just completed is attached to a large grid, as in Figure 2. Besides fully supporting a sheet of plywood while it's cut, the grid also has a heavy-duty lower rail that the workpiece rests upon.

The Grid. Despite its size, building the grid won't take much time. That's because it's made from 2x2s. There are two things to point out. First, the screws are set into deep countersinks so the saw blade won't hit them (Figure 2a).

The other thing to mention is that the center and outer posts act as feet for the panel saw. Each one has a simple leveler consisting of a bolt and T-nut (Figure 2b). Once the grid is complete, you can screw it to the upper assembly.

Lower Rail. Along the bottom, you can see a wide, lower rail. This is simply a 10'-long 2x6.

Along the rail, I drilled a series of holes to hold short sections of dowel. They support the bottom edge of the plywood, as in Figures 2 and 2b. The dowels aren't glued into the holes so you can replace them if they get chewed up.

Stops. Before attaching the rail to the grid, I also installed some stops at each end. These are nothing more than short pieces of aluminum angle. One is used as a workpiece stop. The other two prevent the saw carriage from sliding off the ends of the rail.

The lower rail can now be screwed to the grid. As you are doing this, make sure the rail is perfectly parallel to the support panel. This will ensure that you get straight, square crosscuts.

Cleats. To mount the grid to the wall, I made a set of angled cleats and attached them to wall studs with lag screws. Once they're in place, you can hang the grid and screw it down (Figure 2a).

sliding Carriage

Smooth Sliding. *The carriage rides along the rail on three sets of bearings.*

At this point, the base of the panel saw is complete. The next step is to build the sliding carriage that rides on the rail. This carriage needs to have a firm grip on the rail so any cut you make is straight and true. But it also needs to slide smoothly for precise rip cuts and for easy positioning to make crosscuts.

In the drawing below, you can see all that goes into making this portion of the panel saw. It consists of an L-shaped wood assembly with a set of aluminum supports. Bearings on the supports allow the carriage to glide smoothly along the conduit rail (photo above).

Carriage Top. I started building the carriage by making the top. It's really just a thick board with a pair of angled grooves cut in it. Each groove is sized to accept a piece of aluminum angle. The End View drawing below shows you just where to make the cuts.

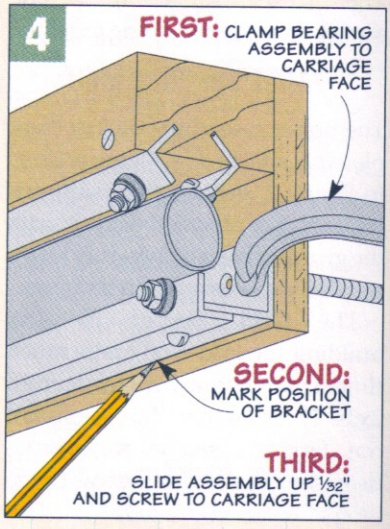
The exposed leg of each piece of aluminum angle has a pair of bearings bolted to it (Figure 3). To keep the saw carriage level, you'll need to make sure the holes are drilled accurately. Then to provide clearance for the bearings, I used 3/16" washers that I drilled out to 1/4".

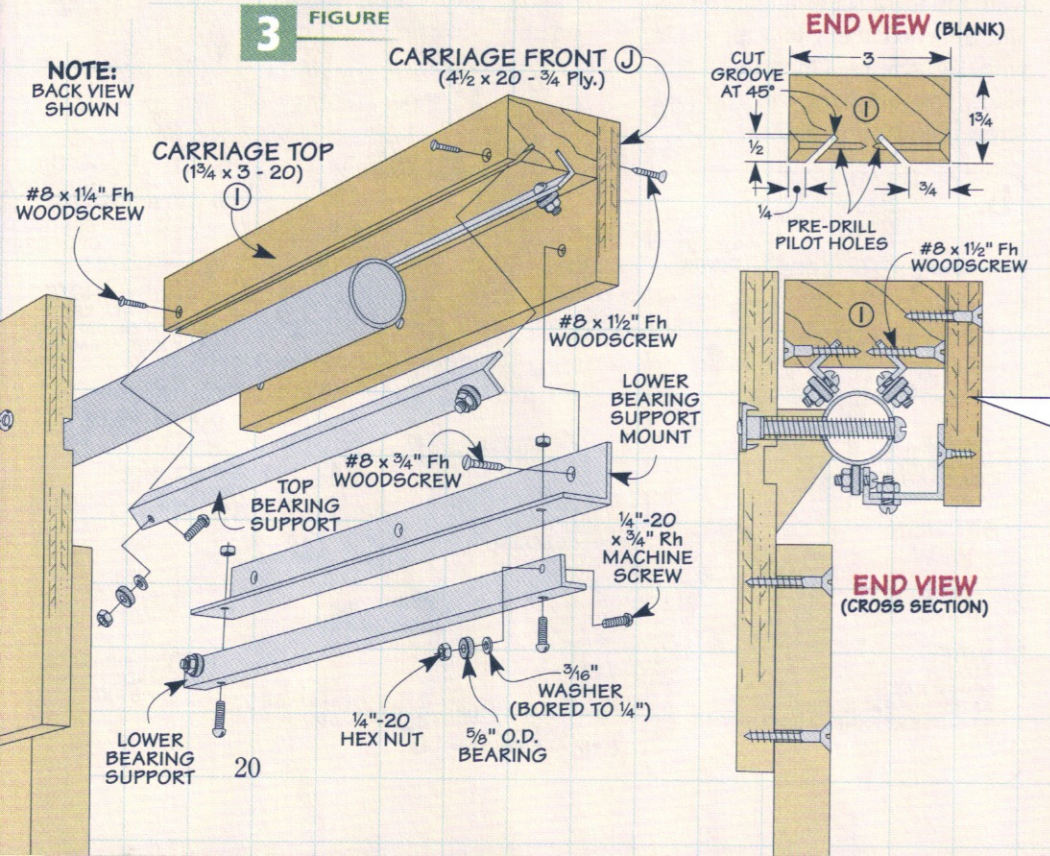
Screw it in Place. The aluminum angles should fit snug in the grooves. But to ensure they stay in place during use, I drove a couple of screws into each piece.

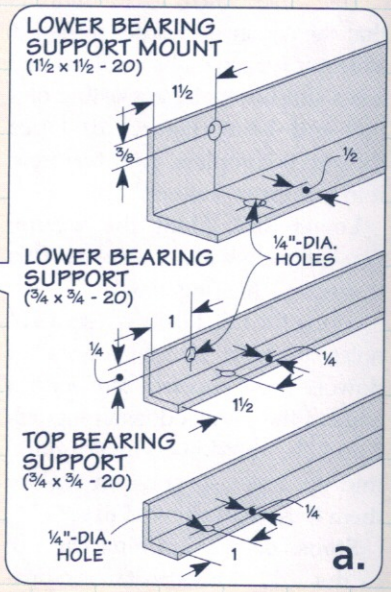
Face. The bearings in the top ride on the top of the rail. But for the best accuracy and stability, the carriage needs to grab onto the bottom of the rail as well.

To do this, I screwed a plywood face to the front of the top. Then, I made a pair of aluminum angle sections to wrap around the rail, as shown in the End View below.

A Firm Grip. Although attaching this assembly of aluminum angle and bearings seems simple enough, there's one thing I should point out here. The bearings need to grab the rail with just the right







amount of pressure. If the grip is tight, the carriage will be too stiff to operate smoothly. A loose grip results in the carriage jiggling as it moves. But don't worry, there's a simple way to get just the right amount of squeeze on the rail.

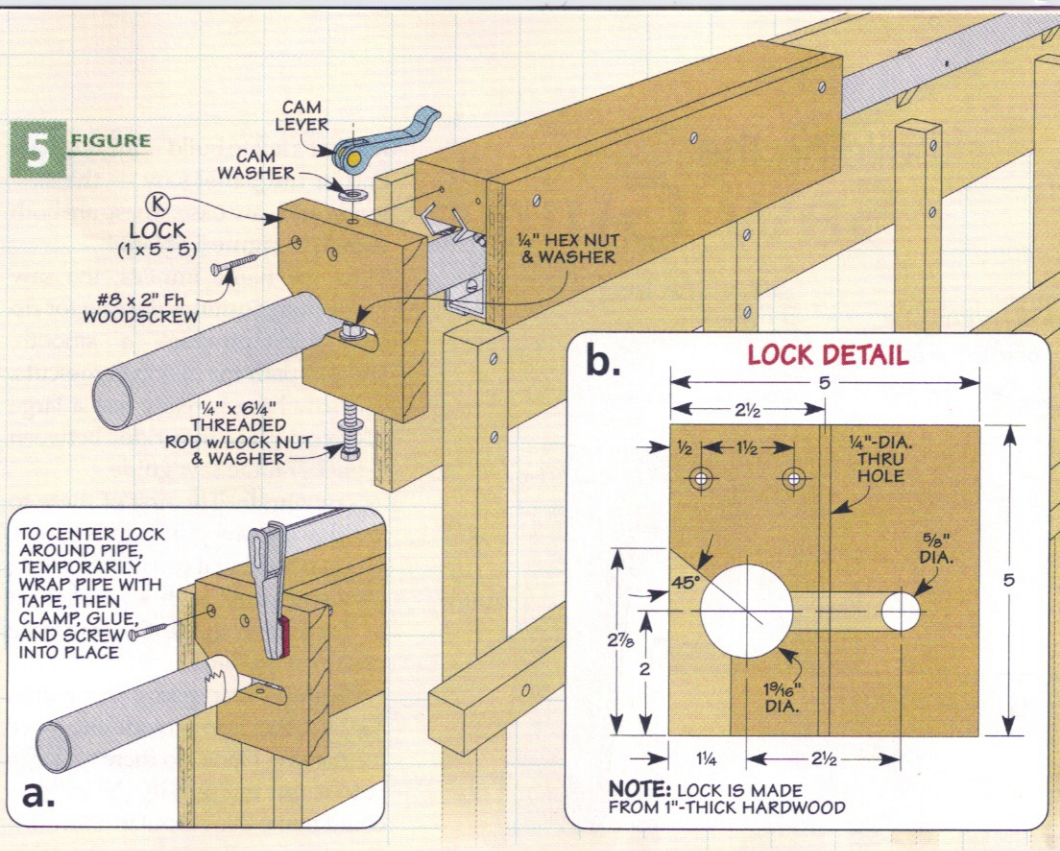
Here's how to do it. Start by putting together the lower aluminum angle and bearing assembly, but don't screw it to the face just yet. Then place the carriage assembly on the conduit rail. Now, clamp the lower bearing assembly so it just touches the rail, as in Figure 4.

Mark and Drill. With a pencil, mark the location of the aluminum angle on the carriage face, and then remove the clamps. Now, mark and drill the mounting holes so the angle is about 1/32" above the line you marked. That should give just the right pressure for a solid grip.

LOCKING ASSEMBLY

There's only one other part that you'll need to make to complete the saw carriage. And that's the lock, as illustrated in Figure 5.

This simple assembly allows you to make accurate crosscuts in a sheet of plywood by securely clamping the carriage to the rail. And you'll find that making it is pretty simple, too.



Making the Lock. In Figure 5b, you can see the lock starts as a square blank. For the lock to fit over the rail without binding, I made a hole in it that's a bit larger than the rail. This is just a matter of sanding the hole after it's drilled.

The next thing is to prevent the lock from catching on the rail support blocks as the carriage slides. You can do this by cutting away a portion of the back edge, as shown.

The final step is a relief cut. This allows the lock to flex a bit to fix the carriage in place. And to get the lock to flex and clamp down on the rail, I used a cam clamp, a bolt, and some washers, as you can see in Figure 5. Using a fast-acting cam clamp really makes setting up the saw for crosscuts fast. When this step is complete, you can screw the lock assembly to the carriage, as shown in Figure 5a.

Materials & Hardware

PANEL SUPPORT

A	Support Panel (1)	10 x 96 - ¾ Ply.
B	Pipe Support Blocks (7)	1 x 1⅝ rgh. - 2½
C	Long Grid Legs (3)	1½ x 1½ - 63
D	Short Grid Legs (4)	1½ x 1½ - 58
E	Horizontal Grid Rails (5)	1½ x 1½ - 96
F	Lower Rail (1)	1½ x 5½ - 120
G	Dowel Rests (19)	¾ x 2½
H	Wall Cleats (2)	1½ x 4½ - 18

CARRIAGE

I	Carriage Top (1)	1¾ x 3 - 20
J	Carriage Front (1)	4½ x 20 - ¾ Ply.
K	Lock (1)	1 x 5 - 5

SAW GUIDE & PANEL

L	Saw Guide Panel (1)	20 x 68 - ¾ Ply.
M	Left Foot (1)	1 x ⅞ - 3½
N	Right Foot (1)	1 x ⅞ - 7
O	Saw Base (1)	16½ x 16½ - ¾ Ply.

- (1) 1¼" x 10' EMT Conduit (1½" OD)
- (7) ¼"-20 x 3" Rh Machine Screws
- (7) ¼"-20 Pronged T-Nuts
- (16) #8 x 2" Fh Woodscrews
- (51) #8 x 1½" Fh Woodscrews
- (3) ⅜"-16 Pronged T-Nuts
- (3) ⅜"-16 Hex Nuts
- (3) ⅜"x 4" Carriage Bolts
- (1) 1½" x 1½" - 36" Aluminum Angle (⅛" thick)
- (1) ¾" x ¾" - 72" Aluminum Angle (⅛" thick)
- (1) 1½" x 48" Aluminum Bar (⅛" thick)
- (10) ¼"-20 x ¾" Rh Machine Screws
- (15) ¼" Hex Nuts
- (6) R4 Steel Bearings (¼" ID, ⅝" OD)
- (6) 3⁄16" Washers, bored to ¼"
- (11) #8 x 1¼" Fh Woodscrews
- (2) #8 x 1½" Rh Woodscrews
- (17) #8 x ¾" Fh Woodscrews
- (1) ¼" x 2" Lag Screw
- (2) 1¼"-Dia. Steel Patio Door Rollers
- (1) ¼" x ¾" Hex Bolt
- (1) ¼" x 1¼" Hex Bolt
- (1) ⅛" x 3⁄16" Awning Pulley
- (2) 9⁄16" x 16½" x .054" Extension Springs
- (1) 7' x 1⁄16" Braided Cable
- (2) 1⁄16" Compression Cable Clamps
- (8) #8 x ¾" Rh Woodscrews
- (12) #8 x ½" Rh Woodscrews
- (3) 48" T-Tracks
- (4) 5⁄16" x 1" Flange Bolts
- (4) 5⁄16" Washers
- (4) 5⁄16" Through Knobs
- (1) 5⁄16" Cam Lever w/Washer
- (1) ¼"-20 x 6¼" Threaded Rod
- (1) ¼"-20 Nylon Lock Nut
- (2) ¼" Washers
- (2) Rubber-Insulated Wire Clamps
- (3) Toggle Clamps w/Screws
- (4) ⅜" x 6" Lag Screws
- (4) ⅜" Washers
- (1) 4' Self-Adhesive Measuring Tape
- (1) 12' Self-Adhesive Measuring Tape
- (1) 12" x 12" Plastic Laminate

building the Saw Guide

All that's left to build is the business end of the panel saw — the saw guide and saw base. These are both shown in Figure 6 at left.

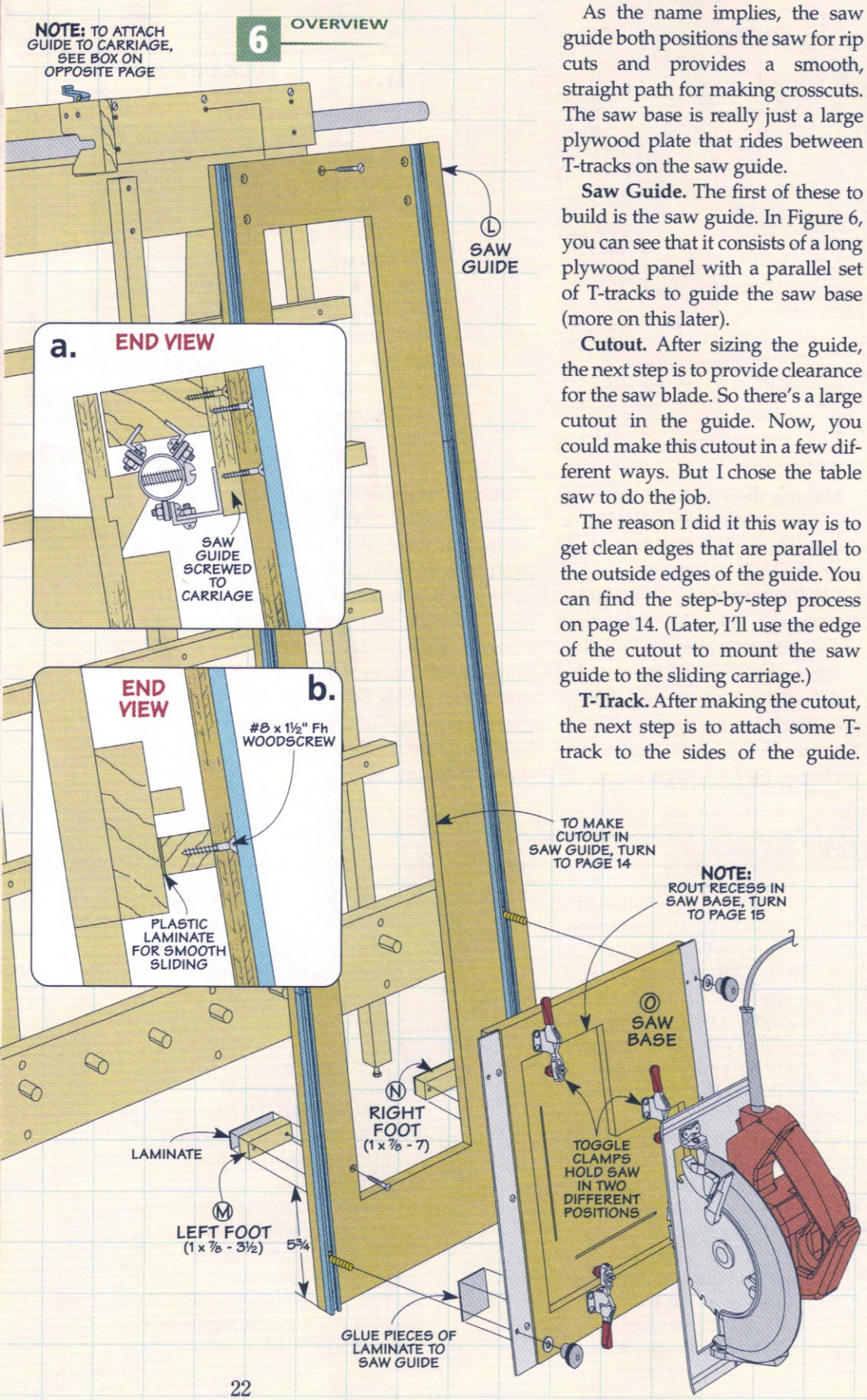
As the name implies, the saw guide both positions the saw for rip cuts and provides a smooth, straight path for making crosscuts. The saw base is really just a large plywood plate that rides between T-tracks on the saw guide.

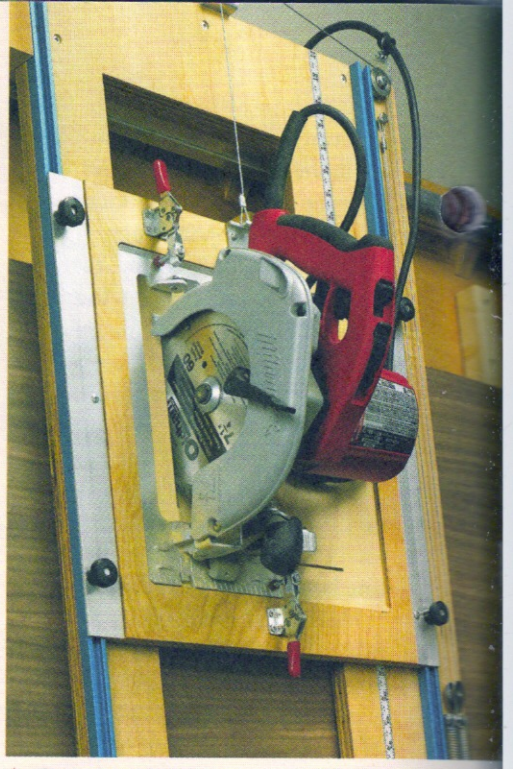
Saw Guide. The first of these to build is the saw guide. In Figure 6, you can see that it consists of a long plywood panel with a parallel set of T-tracks to guide the saw base (more on this later).

Cutout. After sizing the guide, the next step is to provide clearance for the saw blade. So there's a large cutout in the guide. Now, you could make this cutout in a few different ways. But I chose the table saw to do the job.

The reason I did it this way is to get clean edges that are parallel to the outside edges of the guide. You can find the step-by-step process on page 14. (Later, I'll use the edge of the cutout to mount the saw guide to the sliding carriage.)

T-Track. After making the cutout, the next step is to attach some T-track to the sides of the guide.





▲ *Two-Position Base. The circular saw clips into the base with toggle clamps for ripping and crosscuts.*

These will act like railroad tracks to help the saw run perfectly straight during a cut. The tracks also add rigidity to the assembly.

There's one other thing about attaching the T-tracks to point out. Since the guide is longer than the 48"-long T-track, you'll need to use two pieces for each side of the guide. And to keep the saw base from snagging on the joints, it's a good idea to stagger the joints — one at the top and the other near the bottom.

You can see how I screwed the tracks to the guide in Figure 7. The key is to position the tracks parallel so the saw base can slide smoothly.

To do this, I used a plywood spacer. (Later, you'll make the saw base out of this spacer.) After attaching one track flush to the edge of the guide, I set the spacer down next to it, and then screwed the other track in place.

Feet. Before attaching the guide to the saw, I made a pair of feet for the bottom of the guide. These feet support the guide so it's parallel with the piece being cut.

But plain wood feet wouldn't slide smoothly on the lower rail. So to keep the sliding assembly running as smooth as possible, I glued

a piece of plastic laminate to the bottom of each foot (Figure 6b).

Mounting the Guide. At this point, you're ready to attach the guide to the carriage. To ensure accuracy, you want to make sure the guide is mounted square to the lower rail. You can see how to do this in the box below.

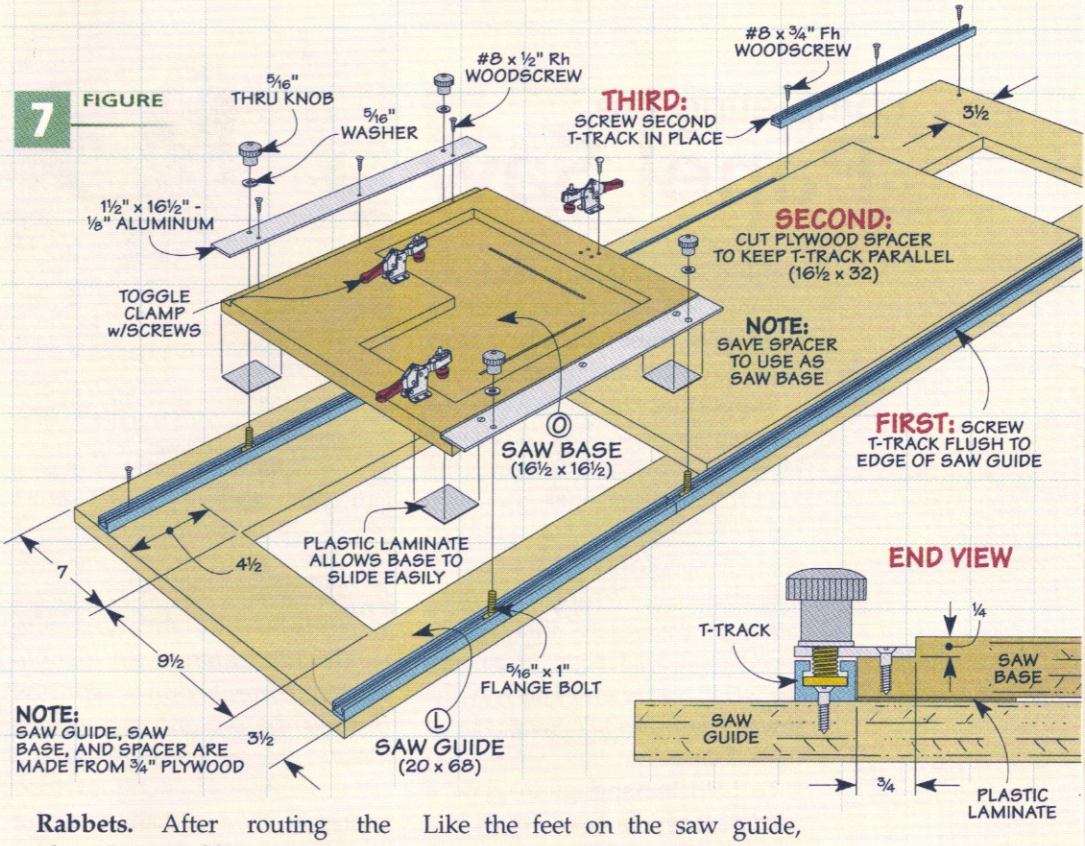
SAW BASE

The other part of the saw guide system to make is the saw base. It fits between the T-tracks mounted on the guide, as in Figure 7.

This extra-large baseplate has shallow pockets in it to hold the circular saw in one of two positions. One great feature of the base is that the saw is attached with toggle clamps. This lets you quickly reposition the saw to switch from ripping to crosscutting (or vice versa).

Making the Base. To make the base, start with the spacer you made earlier. Then cut it to final size, as shown in Figure 7.

To provide enough depth of cut for the saw, I routed shallow pockets in the base. These have the added benefit of holding the saw in position for cutting. Turn to page 15 to see how to do this.



Rabbets. After routing the pockets, I cut a rabbet on each side of the saw base. The rabbets are sized to hold a piece of aluminum bar stock. The aluminum is screwed to the base and drilled to accommodate the flange bolts, washers, and knobs used to attach the base to the T-tracks.

The last things to add to the base are a few pieces of plastic laminate. Like the feet on the saw guide, these are attached to the underside of the base so it slides smoothly along the guide (End View above).

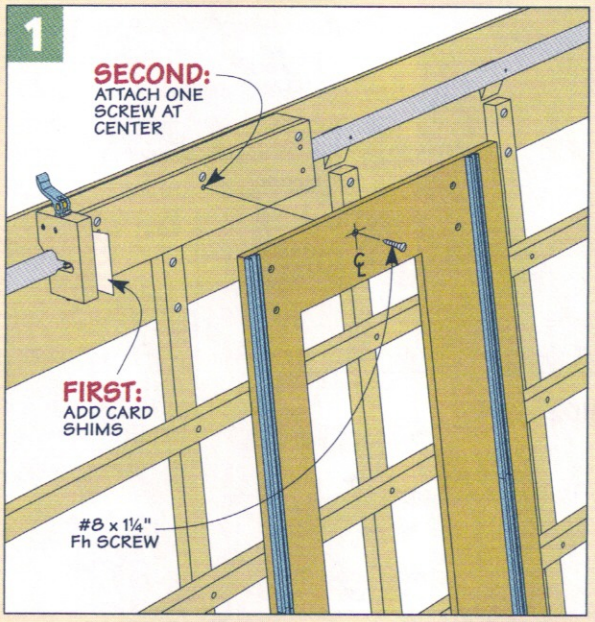
A Few Improvements. At this point, the panel saw is pretty much complete. And you could put it to use as is. But you'll find that you'll get better results and have greater control if you add the extras shown on the next two pages.

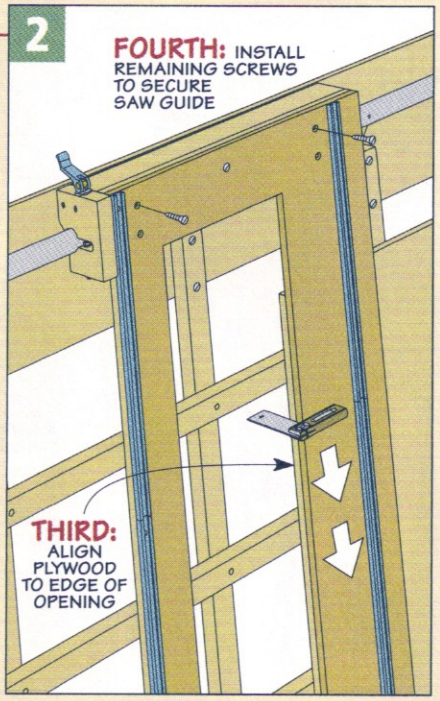
Square-up Saw Guide to Plywood

To make sure the panel saw cuts square, you need to take extra care when attaching the guide to the carriage. The two drawings at right show the steps I took to mount it.

Pivot Point. With a single screw, attach the guide in the center to act as a pivot point (Figure 1). A couple of playing cards act as shims to give you some room for adjustment.

Alignment. Next, place a sheet of plywood with a square edge on the lower rail. Using a square, pivot the guide so the inner edge of the cutout is flush all along the edge of the plywood panel. Once the guide is square, you can drive a few more screws into the carriage to lock the guide in place (Figure 2).





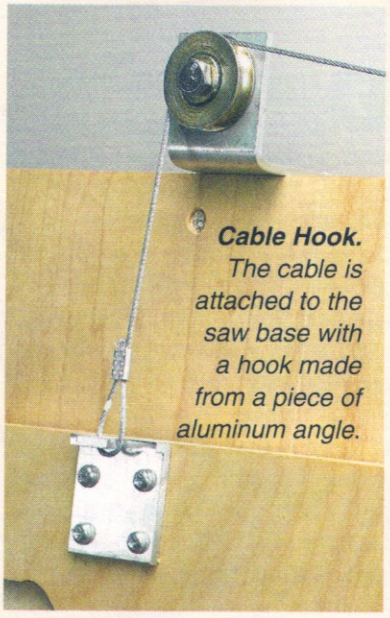
completing the Panel Saw

Getting the panel saw ready for action is just a matter of adding a few details. These will make the saw easier to control and more accurate.

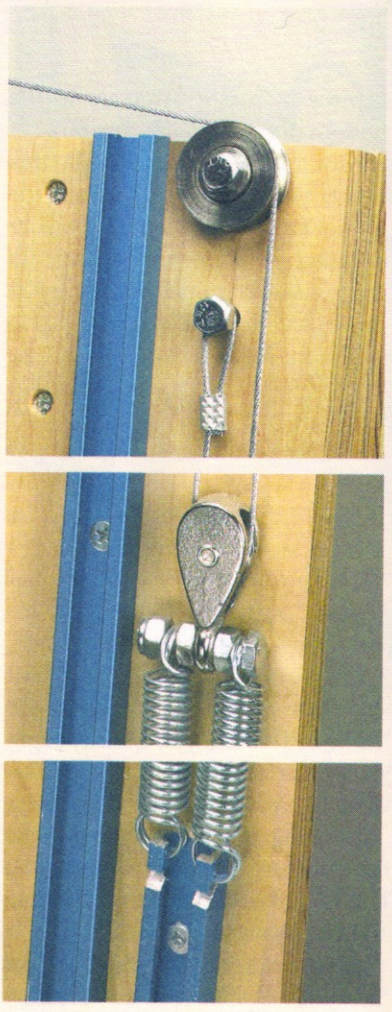
Supporting the Saw. With the saw in place on the base, it can be a bit heavy during use. To lighten the load so it's easier to use, I made a "suspension system," as you can see in the photos at right.

It's basically a spring and pulley setup that acts like an old-fashioned window weight to balance the weight of the saw. This way, the saw will be easier to manage as you make a crosscut.

To hold the springs in place, I used a left over piece of T-track. You can make "hooks" for the springs in the T-track with a hack saw and file, as you can see in the lower photo at right and Figure 9a. To connect the springs to the saw base, I used a system of pulleys, brackets, and a strong, braided cable.



Cable Hook. *The cable is attached to the saw base with a hook made from a piece of aluminum angle.*

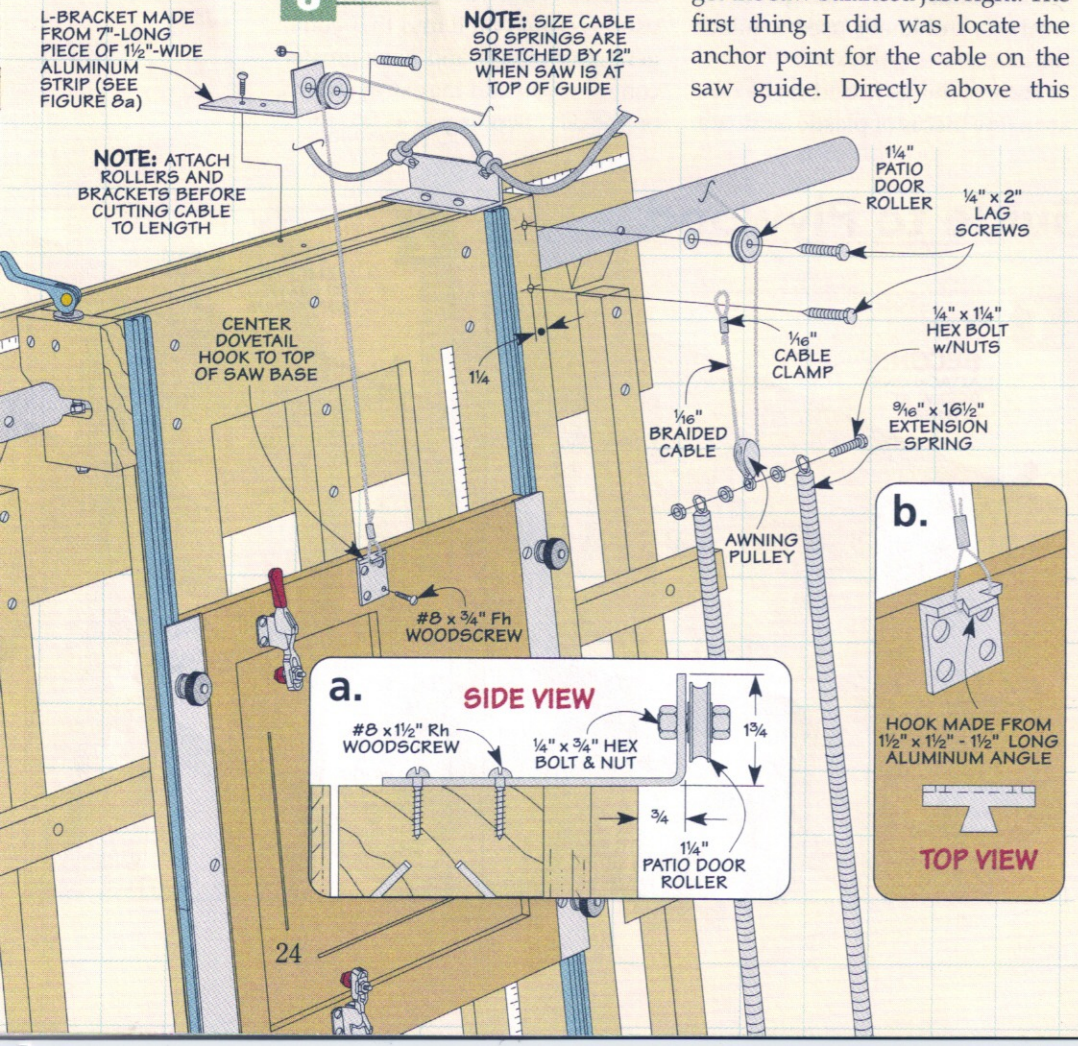


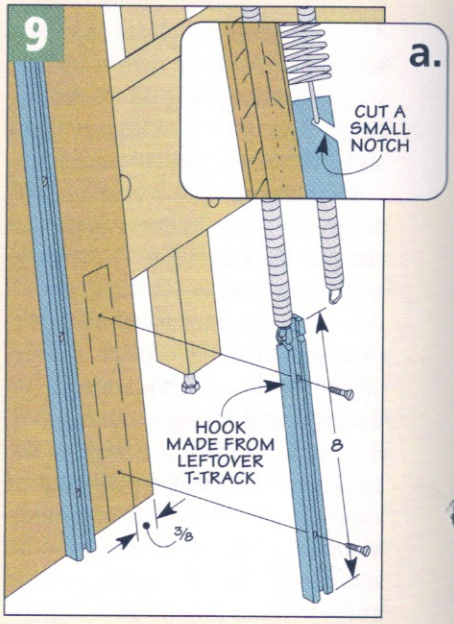
► ***Counterbalance.*** *A simple system of pulleys and springs carries the weight of the saw making cuts almost effortless.*

Pulleys. But before cutting the cable to length, it's a good idea to position the hardware so you can get the saw balanced just right. The first thing I did was locate the anchor point for the cable on the saw guide. Directly above this point, I mounted a pulley that redirects the cable after it comes up from the springs. This pulley is a patio door roller that is attached to the saw guide with a lag screw.

Another patio door roller is mounted to an aluminum L-bracket

FIGURE 8





that's screwed to the top of the carriage assembly, as in Figure 8a.

The anchor point for the other end of the cable is an aluminum bracket located on the saw base. To make sure the cable won't come off the bracket, I shaped the hook to look like a dovetail, as you can see illustrated in Figure 8b.

With all the connection points set, the last thing to do is to connect the springs to a pulley. For this, I used a bolt and a few nuts (Figure 8).

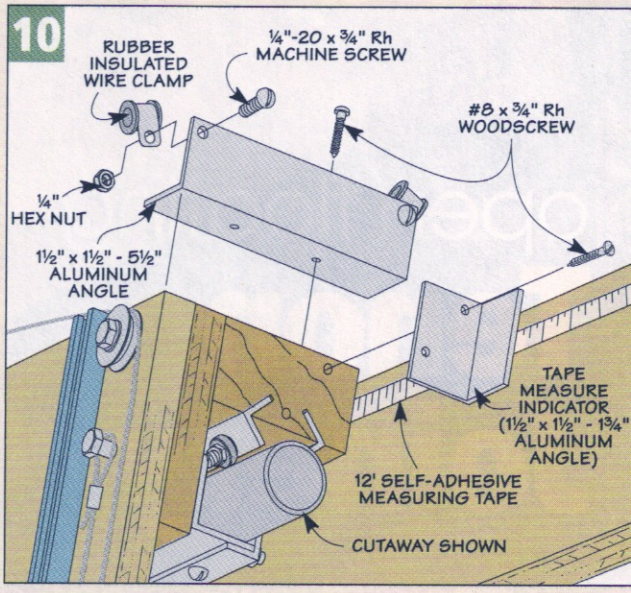
Size the Cable. Now, you're ready to connect all the parts with a length of cable. The cable needs to be sized so that the springs balance the weight of the saw.

Here's how I did this. First, I attached the circular saw to the base and positioned the base about an inch below the top bracket. Then I made a loop in one end of the cable and connected it to the anchor point on the guide.

After threading the cable through the pulley on the springs and around the upper rollers, pull the cable to extend the springs about 12". Now, mark the cable where it meets the hook on the saw base. Finally, you can release the tension, cut the cord to length, and then finish it with a loop.

Cord Guide. The spring system takes care of the weight of the saw. But I wanted to keep the power cord out of the way as well. This way, it won't get snagged in the middle of a cut.

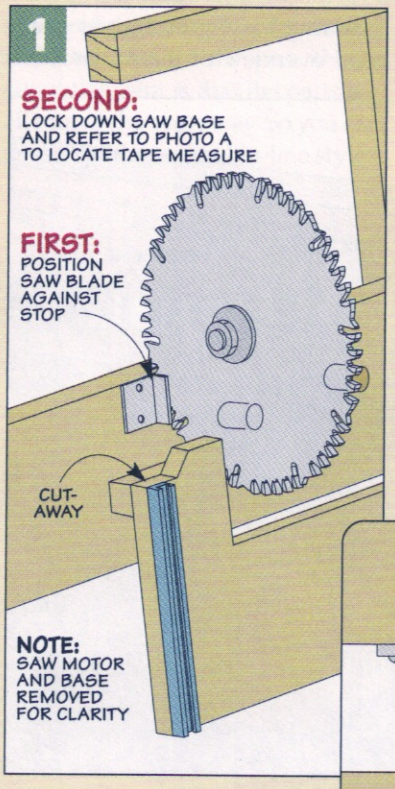
To do this, I used a set of rubber-lined clamps attached to a bracket on the carriage, like you see in Figure 10. This allows the power cord to drape behind the grid, safely out of the way.



Measuring Tapes. Finally, in the box below, you can see how I added a pair of measuring tapes to set up for accurate cuts.

Installing the Measuring Tapes

Making accurate cuts on the panel saw depends on locating the measuring tapes precisely. As you can see in the drawings below, there's a simple way to do this.



Crosscuts. I placed the tape for making crosscuts on the top rail support (photo at right). To indicate the saw's position, I screwed the aluminum indicator to the carriage assembly. Then, to find the "zero" position, you'll need to slide the saw down and align the edge of the blade against the aluminum stop on the lower rail. You can see this in the Top View of Figure 1. This is the starting point, and you can now press the tape in place.

Rip Cuts. The process is almost identical for rip cuts. After putting the saw in the rip position, rest the edge of the blade on the top of a dowel (Figure 2). Here, I placed the tape on the saw guide and used the top of the saw base as the reference line, as in the far right photo.