

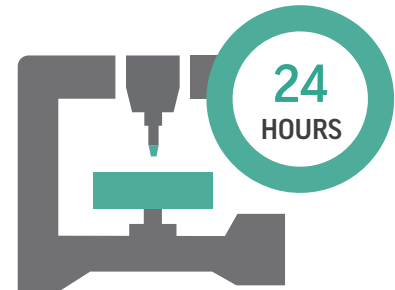
Creating Jigs and Fixtures

3D Systems Digital Light Projector (DLP) technology, FabPro™ 1000

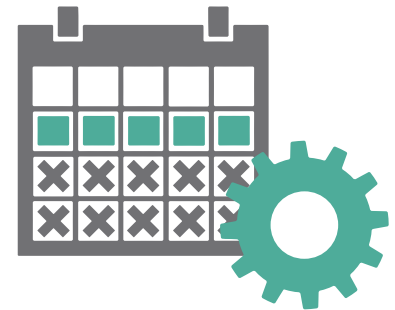
A key application that can be performed by the FabPro is producing jigs and fixtures. These parts play a key role in the manufacturing process and the ability to print them quickly and affordably saves time, money and effort.

Manufacturing, especially mass production, is a function of balancing speed and quality. Maximizing production speed while maintaining high part quality is critical for success. Jigs and fixtures are used to make manufacturing and assembly processes repeatable and more reliable, reducing cycle times and improving worker safety.

In the past, jigs and fixtures were produced with metal. This is no longer required as 3D printed materials have grown in durability. Using the FabPro, jigs and fixtures can be printed using functional resins ideal for replacing metal fixtures in automated machining operations and assembly lines. This has expanded the scope of the FabPro to serve a variety of manufacturing facilities, spanning from small run shops to mass production houses and foundries.



Create assembly jigs in a day

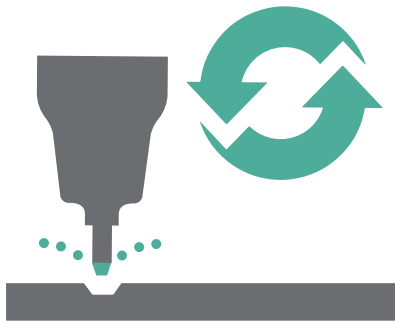


Take months out of production line set up



Jig and fixture design basics

In production, fixtures hold a part in a specific position while forces are applied from a secondary operation. The fixture must keep the part from being subjected to an unacceptable amount of force to prevent it from breaking or becoming distorted. It is necessary for the fixture to not under-constrain the part, which will cause unnecessary movement that will impact accuracy, and to not over-constrain the part that will introduce unnecessary forces and result in other accuracy issues. Because there is such a variety of parts that can be manufactured, this balance is critical to accurate production. Sometimes a more forgiving fixture design is useful to deal with parts that have more variation, while a tighter fixture will work better for parts with more accurate and detailed surfaces. Printing fixtures with the FabPro gives the flexibility to produce fixtures with varying levels of constraint.



Streamline CNC operations and assembly lines

Printing jigs and fixtures with the FabPro

It has actually become more difficult to produce jigs and fixtures through traditional means over the past several years. Engineers have more and more design tools they can use to create fixtures optimized to have the proper amount of constraint. This optimization often results in a custom, complex geometry that is best created with a 3D printer. FabPro can take almost any geometry and turn

it into a functional part optimized for end use. Traditional systems to keep parts in place like vises and clamps cannot provide enough constraint for complex shapes or parts with very fine details. The FabPro allows engineers to create fixtures without limitations. Producing jigs and fixtures with the FabPro saves significant time and cost, eliminating the steps involved in machining sheet metal or other traditional materials. As an added benefit, if a fixture needs to be manufactured with more durable materials than can be provided with 3D Printing, the FabPro can still create a functional prototype which enables manufacturing engineers to test the fixture before committing to tooling. The FabPro can produce fixtures today for parts with curved or complex surfaces that cannot be easily manufactured using traditional methods, saving time, cost and significant effort.

The cost savings of using FabPro for fixtures

The costs saving of printing with FabPro is significant. The time saving is drastic. A typical aluminum-milled fixture costs about \$450 and takes 3-5 days to produce. The typical 3D printed fixture costs about \$45 and can be printed in less than a day, with no additional time needed for complex geometries vs. simple ones. That is a cost savings of 10 times!



Reduce jigs and fixtures manufacturing cost by up to 10x

Common jigs and fixtures the FabPro can produce

The FabPro can accurately print a range of jigs and fixtures. It is ideal for producing:

- Drill guides, which keeps drill bits in place while in use
- Gauges to confirm a go/no-go decision. This is useful for quality control inspectors to ensure if a part meets
- Assembly and Disassembly Jigs
- Bonding Jigs
- Vise and Clamp Inserts
- Masking Templates

How does FabPro build better jigs and fixtures?

FabPro has the same amount of ease to print complex vs. simple designs and no additional cost, provided the size is the same. This allows the FabPro to build additional functionality into the jig or fixture. Where can this be helpful?

- Producing small features that would be difficult to machine
- Complex geometries considered impossible to machine due to tool clearance in milling or turning
- “Engravings” can be part of product design instead of an additional step. This allows the FabPro to print serial numbers, lot tracking, fabrication dates, and other key information

- Printing single parts that traditionally have been made with two components. This eliminates gaps where the two parts are bonded that often act as a failure point, resulting in a stronger, more reliable part
- Increasing rigidity in the design phase instead of with post production modification. The typical way to increase stiffness of a machined fixture is to add extra material in areas that are subjected to the highest amount stress and force. Printing with the FabPro can design reinforced ribs that provide additional structure without significantly increasing the cost or build time of the part.
- Keeping replacement parts on-hand. Even under normal usage conditions, fixtures, assembly tools, and jigs commonly become broken or worn to the point where they are no longer effective. Printing with the FabPro allows several fixtures to be built at one time in the same build cycle. This means there is minimal delay when a jig or fixture needs to be replaced.



Build precision and complexity for improved quality