

Creating and Assigning Primary Calendars for Resources and Secondary Calendars to Secondary Constraints

1 Configuring Primary Calendars

Primary Calendars are used to model a Resource's active availability or time constraints.

Within the Scheduler window, navigate to available Primary Calendar Templates (Figure 1.1) to see all current calendar templates.

| | Preactor Sequencer : Schedu | le | | |
|------------|-----------------------------|----------------|-----------------|--|
| File | Edit View Sequence Too | ls Window Help | | |
| 📼 C | Overview Window | Ctrl+Shift+O | 33 • | • @ |
| tes E | ditor Window | Ctrl+Shift+E | | 18 18 18 18 19 1 18 18 18 19 19 19 19 19 19 19 19 19 19 19 19 19 |
| æ P | Plot Window | Ctrl+Shift+P | × | c |
| шТ | Frace Chart Window | Ctrl+Shift+T | | 09-2017 12-10-2017 12-1 |
| | Utilization Window | Ctrl+Shift+I | H | 00;00 00;00 0 |
| 📼 N | Material Explorer | Ctrl+Shift+M | H | - |
| U | Unscheduled Operations | Ctrl+Shift+U | | ×1111111111111111111111111111111111111 |
| F | Reports | Ctrl+Shift+R | | |
| C | Calendars | • | Π | Primary Resources |
| L | ocate | , | | Secondary Resources |
| <u> </u> | Sauge Lines | | | Primary Calendar Templates |
| Ħ A | Animate Sequencing | | | Secondary Calendar Templates |
| a C | Disable Workspace Tooltips | | | Calendar States Ctrl+Shift+S |

(Figure 1.1)

If an appropriate shift calendar is not available then a new one must be created.

To create a new template select new Primary Calendar Template (Figure 1.2).

| đ | Preactor Sequencer : Sc | hedule | | | | | | | |
|-----|-------------------------|---------|------|---------------------------------|---------------------|---------|-------|--|--|
| Fil | e Edit View Sequence | Tools \ | Wind | low He | lp | | | | |
| | New | | • |) Prima | ry Calendar Templat | e | | | |
| | Clear Schedule | | 1 | 🐒 Secondary Calendar Template 🧉 | | | | | |
| 2 | Open | Ctrl+O | C | 0581 | × | | | | |
| | Load Calendars From D | | | 09-2017 | | 12-10-2 | | | |
| (i | Manage Datasets | | - | | 00;00 | | 00;00 | | |
| | · · · | | | | | | | | |

(Figure 1.2)

Page | 1

www.Lean-Scheduling.com

Lean Scheduling International LLC© 2017 The information in this document is the property of LSI and may not be copied, or communicated to a third party, or used, for any purpose other than that for which it is supplied without the express written consent of Lean Scheduling International, LLC



Below is a screenshot example of creating the Primary Calendar Template – Day Shift w/Lunch (Day)

| Preactor Sequencer : Sch | hedule | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | - 1 | 3 2 |
|--|-----------|-------|------------|-------------|----------|---------|--------|---------|-----------|----------|-----|----|-------------|----|----|------------|-----|---|----------|-----|-----|-----|-----|---------|-----|-----|-----|-----|-----|----------|--------------|-----|---|---------|-------------|--------------|-----|
| File Edit View Sequence | Tools W | Indov | v Help | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 「「とうとの正備で | 1220 | 20 | 열필 / | s- e 1 | 🗎 Add | Period | 1 hour | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 王王 , 龙龙龙龙龙, 王 | +·=-3 | | 1 # 2 | 2 3 0 | 0 1 1 | 1 1 1 | 23: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Primary Templatos • * * | E10vervi | iew | * me | ditor : Red | cord 540 | of 6581 | * | Day ! | hift w/Lu | nch (Day |) × | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 300 Series ^ | Name: | Day | y Shift wi | unch (Day | Y) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Length: | 1 Days 0 Hr | ours 0 Minul | les |
| 615 620 | Ref Date | 9/1 | 12/2016 1 | 2 00 AM | | | * | | | | | | | | | | | | | | | | | | | | | | | | | | | Color: | 0,0,0 | | 9 |
| 640 650 660 | Ch | 1.1 | 1h | 2h | U.I | 3h | | lh | Sh | Л.Î. | 6h | 7n | ЪĽ | 6h | 9h | <u>CLI</u> | 10h | 1 | н | 12h | 13h | IJ. | 14h | 15h | Ŭ. | 16h | 17h | 1.1 | 18h | 198 | h []]] | 20h | 2 | Jh | 22h | 23h | 11 |
| 710 C10 C11 | 9g tevin | | | | | | 88.R* | 1 | | | | | Stora 20%au | | | | | | | | | | | | | | | | | | | | | | | | |
| C12 C13 | State . | | | | | | Effe | sency % | | | | s | lart Offs | ŧ. | | | | | Length | - | | | | End Off | set | | | | | Cost Fac | tor % | | | | | | |
| C14 | OffShift | | | | | | 0.00 | 1% | | | | 0 | 00.00 | | | | | | 07 00:00 | | | | | 07.00.0 | 3 | | | | | 0.00% | | | | | | | |
| C15 C4 | On Shift | | | | | | 100 | 00% | | | | 0 | 7 00 00 | | | | | | 04 30 00 | | | | | 11:30:0 | 0 | | | | | 100.00% | | | | | | | |
| C5 | Short Bre | eak . | | | | | 0.00 | 1% | | | | 1 | 1 30 00 | | | | | | 00.30.00 | | | | | 12:00.0 | 2 | | | | | 0.00% | | | | | | | |
| C6 | On Shift | | | | | | 100 | 00% | | | | 1. | 00.00 | | | | | | 03 00:00 | | | | | 15 00 0 | | | | | | 100.00% | | | | | | | |
| C8 C9 | OffShift | | | | | | 0.00 | 1% | | | | 1 | 5.00.00 | | | | | | 09:00:00 | | | | | 1.00.00 | 00 | | | | | 0.00% | | | | | | | |
| Day Shift wiLunch (Day) Day Shift wiLunch (Merik) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

(Figure 1.3)

On and Off shift periods are created by double clicking the blank rows beneath the timeline after specifying an appropriate length. The current template is for a single-day template so the length has been set to 1 day. A couple highlights on creating the Primary Resource Calendars:

- 1. Preactor (under standard LSI practice) is configured to use Monday as the "0th" or first day. Fill out the reference date on the template to use a Monday in the past. For Preactor models with wider scheduling horizons into the past, use a Monday beyond the historical limit to avoid issues.
- 2. The length field in the top right needs to read "1 Days 0 Hours 0 Minutes" for single-day templates and "7 Day 0 Hours 0 minutes" for weekly templates.
- 3. Detailed calendar template names can be very helpful when reapplying templates for similar resources down the road.
- 4. Save created templates to be able to apply them to larger weekly templates or to Resources.

Creating a weekly template to apply to resources is best done by utilizing the single-day templates to expedite the process. Create a new weekly template using the same File > New > Primary Calendar Template path. Open the Primary Calendar Template tab as shown in Figure 1.1 to see the available single-day templates. (Figure 1.4) below shows this view.



(Figure 1.4)

www.Lean-Scheduling.com



An example of building a weekly template is shown below:



(Figure 1.5)

This template is built from the example in Figure 1.3 by dragging and dropping the highlighted single-day template on the left into the timeline of the new 7-day template on the right. Notice the reference date used is again a Monday in the past well beyond the current scheduling horizon's historical data. Repeating this process five times sets Monday – Friday of the weekly calendar. Saturday and Sunday in this example are off shit and set manually as shown in the highlighted bottom row.

www.Lean-Scheduling.com



2 Applying Primary Resource Calendars

To apply the new Primary Resource Calendar, open the Primary Resources tab demonstrated in Figure 1.6 and selecting an available resource that will use the new template (Figure 1.7).

| đ | Preactor | Seq | uencer : Scł | nedule | | | | | | | | | |
|-----|--|------------------------|--------------|--------|----------------|------|-----------------|---------------------|---|--|--|--|--|
| Fi | le Edit V | ïew | Sequence | Tools | Window | Help | | | | | | | |
| 114 | Overview Window Ctrl+Shift+O | | | | | +0 | 33 • | | | | | | |
| 01 | Editor Window | | | | Ctrl+Shift | t+E | | s & X 🗷 💐 | * 🗷 🐮 🍕 👓 🗸 🚿 🖩 📬 💡 | | | | |
| - | Plot Window | | | | Ctrl+Shift+P × | | | | | | | | |
| 122 | Trace Chart Window C Utilization Window C Material Explorer Cf | | | | Ctrl+Shift | +T | | 9-2017 | 12-10-2017 | | | | |
| 155 | | | | | Ctrl+Shift+I | | | 0;00 | 00;00 | | | | |
| | | | | | Ctrl+Shift+M | | | | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | | | | |
| | Unsched | Unscheduled Operations | | | Ctrl+Shift+U | | | | | | | | |
| | Reports | | | | Ctrl+Shift | +R | | | | | | | |
| | Calendar | 5 | | | | • | Γ | Primary Reso | ources | | | | |
| | Locate | | | | | • | | Secondary Resources | | | | | |
| | Gauge Li | Gauge Lines | | | | | | Primary Cale | ndar Templates | | | | |
| Ħ | Animate | Sequ | uencing | | | | | Secondary C | alendar Templates 🛛 🖉 | | | | |
| /=: | | 1 0 | ` | | | | | | | | | | |

(Figure 1.6)

| File Edit View Sequence Tools Window Help Go | |
|--|---------------------|
| 📽 📾 🗐 🖋 🍼 🕫 市 西 西 西 西 西 🕮 路・ 💩 👖 Today 🖬 Day 🔟 Week 🛅 Month 🖕 | |
| 田間 - A A A A A A A A A A A A A A A A A A | |
| Primary Resource. 🗸 🕴 🛪 📾 Overview 🗙 📾 Editor : Record 540 of 6581 🗙 📾 A1-10 Pneumatic Table - 1 🗴 | |
| 920-emboss 930-930 Primary Resource Calendar | |
| 940-Spot Welding Sunday Monday Tuesday We | dnesday |
| 990-Parts Washer November 26 27 28 | |
| 970-Chromate/Alodine Default Day 5 | hift w/Lunch (Week) |
| 980-Tapping Arm State St | |
| 99-Inspection | |
| 990-Assembly Machines, Pr | |
| A to Promatic Table 2 | |
| A I-10 Programatic Table - 2 | |
| A 1-20 Hydraulis Table - 2 | |
| A1-30 Abor Press 1 | |
| A1-30 Arbor Press - 2 | |
| A1-40 One PC Flow Line 3 4 5 | |
| A1-50 Assy | hift w/Lunch (Week) |
| A2-30 Arbon Press - 1 | and an currently |
| A2:30 AD01 Press - 2 | |
| 2-40 One PC Etwilling | |
| (Figure 1.7) | |

Double click the grey bar spanning across the week to view the configuration window in Figure 1.8. Apply the correct template and expand "Apply Changes to Resources" to select all resources that will use the same Primary Calendar Template.

www.Lean-Scheduling.com

Lean Scheduling International LLC© 2017 The information in this document is the property of LSI and may not be copied, or communicated to a third party, or used, for any purpose other than that for which it is supplied without the express written consent of Lean Scheduling International, LLC



| Calendar Period | | | | | | | | | | | |
|--|---|--------|--------|--|--|--|--|--|--|--|--|
| Period | | | | | | | | | | | |
| Template | Day Shift w/Lunch (Week) | \sim | | | | | | | | | |
| Start Time | No Limit | \sim | | | | | | | | | |
| End Time | End Time No Limit | | | | | | | | | | |
| Reference Apply Cha A2-70 Pe A1-10 Pn A1-20 Hy A1-30 Art A2-30 Art A2-30 Art | a Date anges to Resources m Gun eumatic Table - 2 draulic Table - 2 por Press - 2 por Press - 3 OK | Canc | ^ > | | | | | | | | |



Select "OK" and save all calendar changes to apply.

www.Lean-Scheduling.com



3 Set Secondary Resource Constraint Capacities

Create secondary constraints on the Secondary Constraints table in Data Maintenance. For this example, the secondary constraint being created and applied will be "AOperators". To add a new secondary constraint, double click the blank record at the bottom of the list as highlighted in Figure 1.9. Name the constraint and select "OK" to save the new addition.

| Resources | | | - | | | | |
|--------------------------|------------------|-------------------|--------------|----------|---|--------------|--------|
| Mr Secondary Constraints | Secondary Const | raints | ? | × | | \checkmark | 0.0000 |
| | Namo | AOperators | | | | \checkmark | 0.0000 |
| Orders | Name. | rioperators | | _ | | \checkmark | 0.0000 |
| 🛒 Supply | 6 | ✓ Use as a Consti | raint | | | \checkmark | 0.0000 |
| Demand | [| 11 100% 16 C | | | | \checkmark | 0.0000 |
| Orders | Calendar Effect: | Use 100% if Great | ter Than 09 | <u> </u> | | | 0.0000 |
| Materials | | Infinite Mod | e Behavior. | | | | 0.0000 |
| 📕 Bill of Materials | | initia inou | e benarion | | _ | | 0.0000 |
| Co-products | | Display C | Options | | _ | | 0.0000 |
| | i i | Assulta | utee | | | | 0.0000 |
| | | Attrib | utes | | | | 0.0000 |
| | Cost Per Hour: | 0.0000 | | | | ~ | 0.0000 |
| | | | | | | \checkmark | 0.0000 |
| A | - Ŀ | Use Cost Facto | r Shift Mult | tiplier? | | \checkmark | 0.0000 |
| Workspace | | | | | | \checkmark | 0.0000 |
| Data Maintenance | | ОК | Cano | cel | | 1 | 0.0000 |
| 2 | - | | | | | \checkmark | 0.0000 |
| Configuration | | | | | | | |
| 4- | M3Setters | | 4 | | | \checkmark | 0.0000 |
| Workspace | A5Assy | | | | | \checkmark | 0.0000 |
| Data Maintenance | 301 Operators | | 1 | | | \checkmark | 0.0000 |
| | AOperators | | 1 | | | | 0.000 |
| | perators | | 1 | | | | 010000 |



To apply the secondary constraint to necessary resources, use the Resources tab under Data Maintenance. Double click the resource to apply the constraint to and on the resource options dialog, select Secondary Constraints. Add the constraint as valid and double click the valid constraint to open a configuration window pictured on the far right in Figure 1.10. Here the resource is told when to consume the constraint (Constraint Usage) and how much to consume (Constraint Quantity).





Once secondary constraints have been properly added and set to the required resources, the secondary constraint needs a range or maximum value. This is set within the scheduler window. Open "Secondary Resources" (Figure 1.11) in the scheduler window and select the secondary constraint to configure the available values. If configuring a secondary constraint to use a set maximum value, the example in Figure 1.12 shows how to set a minimum and maximum value for the constraint using "Custom Values". If secondary constraint maximum values fluctuate with changing shifts, a Secondary Calendar Template can be created to model shift patterns. Figure 1.13 shows how to add a new Secondary Calendar Template. The process for creating Secondary Calendars is the same as the process for creating Primary Calendar Templates. Secondary constraints should never contain a maximum value of "0" as this forces Preactor to release a constraint mid-operation which it does not do. The result of this occurrence prevents Preactor from scheduling longer operations indefinitely. Figure 1.14 shows proper assignment of fluctuating secondary constraints with varying operator availability and off-shifts. Notice how off-shifts are not reflected in secondary constraint calendars, off-shift periods are controlled by Primary Calendars.



| Fil | e Edit View Sequence T | ools Window Hel | p | | | | | | | | | | |
|-----|------------------------|-----------------|---|--|--|--|--|--|--|--|--|--|--|
| | Overview Window | Ctrl+Shift+O | A· @ B·, | | | | | | | | | | |
| | Editor Window | Ctrl+Shift+E | 1 2 2 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | | | | | | | | | | |
| - | Plot Window | Ctrl+Shift+P | P × | | | | | | | | | | |
| | Trace Chart Window | Ctrl+Shift+T | 09-22-2017 | | | | | | | | | | |
| 177 | Utilization Window | Ctrl+Shift+I | 00;00 | | | | | | | | | | |
| ••• | Material Explorer | Ctrl+Shift+M | | | | | | | | | | | |
| | Unscheduled Operations | Ctrl+Shift+U | | | | | | | | | | | |
| | Reports | Ctrl+Shift+R | ************************************** | | | | | | | | | | |
| | Calendars | | Primary Resources | | | | | | | | | | |
| | Locate | | Secondary Resources | | | | | | | | | | |
| | C 19 | | Drimany Calondar Tomolator | | | | | | | | | | |

(Figure 1.11)

| Secondary Resource + + × | Charview - Editor - Perord 540 of 6591 | x ADparators x | | | | | | | | | | | |
|--------------------------------------|--|----------------|---------|---------------------------------------|---|--|--|--|--|--|--|--|--|
| 2 Sunnen 30 Ton Press | Secondary Resource Calendar | | | | | | | | | | | | |
| 301 Operators | Sunday | Monday | Tuesday | Wednesday | | | | | | | | | |
| A5Assy | November 26 | 27 | 28 | 5 29 | | | | | | | | | |
| AOperators | | | | Default: Custom Values(Min:0, Max:10) | | | | | | | | | |
| CNC Elastomer Grinding COperators | | | | | | | | | | | | | |
| CSetters | | | Ca | alendar Period | × | | | | | | | | |
| Cylindrical Grind | | | | | | | | | | | | | |
| Elastomer Grinding | | | P | bone | | | | | | | | | |
| Final Assembly Grind Operators | | | T | emplate Custom Values V | | | | | | | | | |
| Grind Steel Centerless | | | S | tart Time No Limit | | | | | | | | | |
| L1L2L3L11WOperators | 3 | 4 | | | | | | | | | | | |
| L ILZSetters | | | E | nd Time No Limit ~ | | | | | | | | | |
| L8L9Setters | | | | | | | | | | | | | |
| LOperators | | | | | | | | | | | | | |
| LSetters M3Operators | | | | Details | | | | | | | | | |
| M3Setters | | | M | in. Value 0 | | | | | | | | | |
| M8Operators M8Setters | | | M | ax. Value 10 | | | | | | | | | |
| Moperators | | | | | | | | | | | | | |
| MSetters | | | | | | | | | | | | | |
| Orbital Riveting Rubber Deflech | 10 | | | Apply Changes to Resources | | | | | | | | | |
| Sand Blaster | | | | 016 | | | | | | | | | |
| Tumble Deburr | | | | OK Cancel | | | | | | | | | |
| | | | | | | | | | | | | | |

(Figure 1.12)

 Image: Sequence - Schedule

 File
 Edit View Sequence - Tools Window Help

 New
 Image: Primary Calendar Template

 Image: Clear Schedule
 Image: Secondary Calendar Template

 Image: Clear Schedule
 Image: Secondary Calendar Template

(Figure 1.13)

www.Lean-Scheduling.com





(Figure 1.14)

Page 8

www.Lean-Scheduling.com