CEE 317 GeoSurveying

Trimble M3 Total Station: Operation Handout
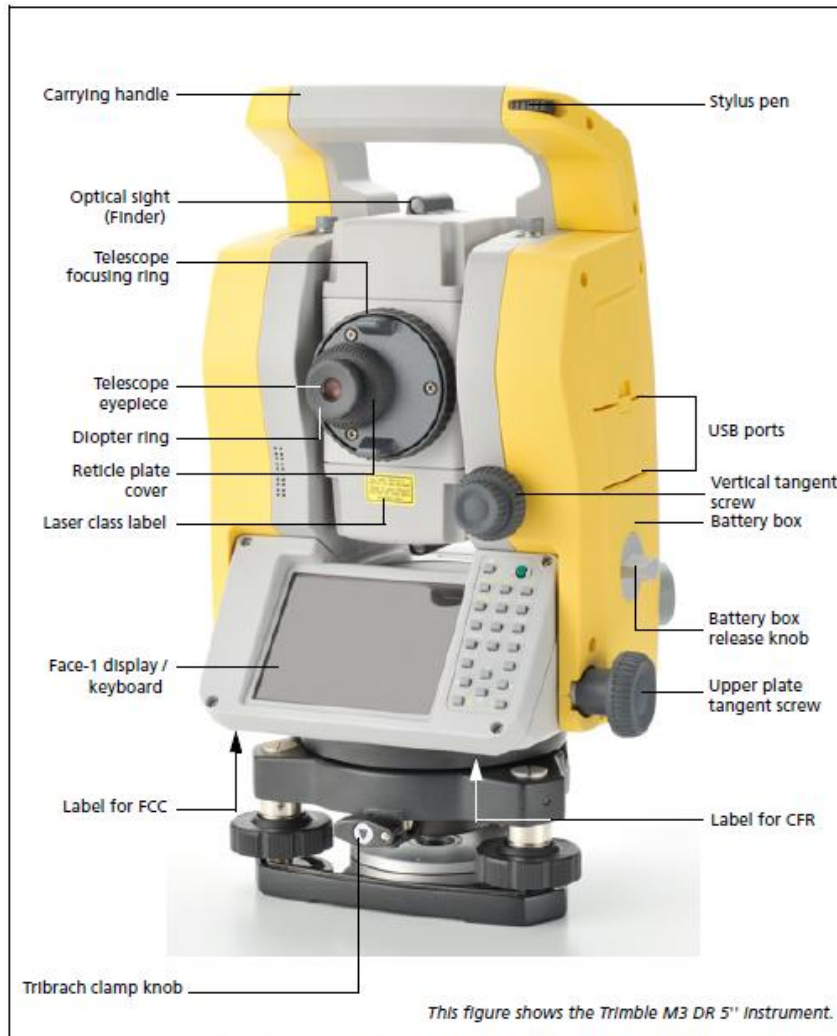

Carrying handle — Stylus pen
Optical sight (Finder)
Telescope focusing ring
Telescope eyepiece
Diopter ring
Reticle plate cover — USB ports
Laser class label — Vertical tangent screw
— Battery box
Face-1 display / keyboard — Battery box release knob
Label for FCC — Upper plate tangent screw
Tribrach clamp knob — Label for CFR

This figure shows the Trimble M3 DR 5" instrument.

Figure 1.1   Trimble M3 DR Series total station – Face-1

Laser class label — Laser aperture label
Objective LASER LIGHT IS EMITTED FROM THIS PART. — Horizontal axis indication mark
Lumi guides — Battery box
Laser plummet — Battery box release knob
Circular level — Data output / external power input connector
⚠ Input voltage shall be 4.5-5.2 V DC
Leveling screw
Tribrach — Laser class label

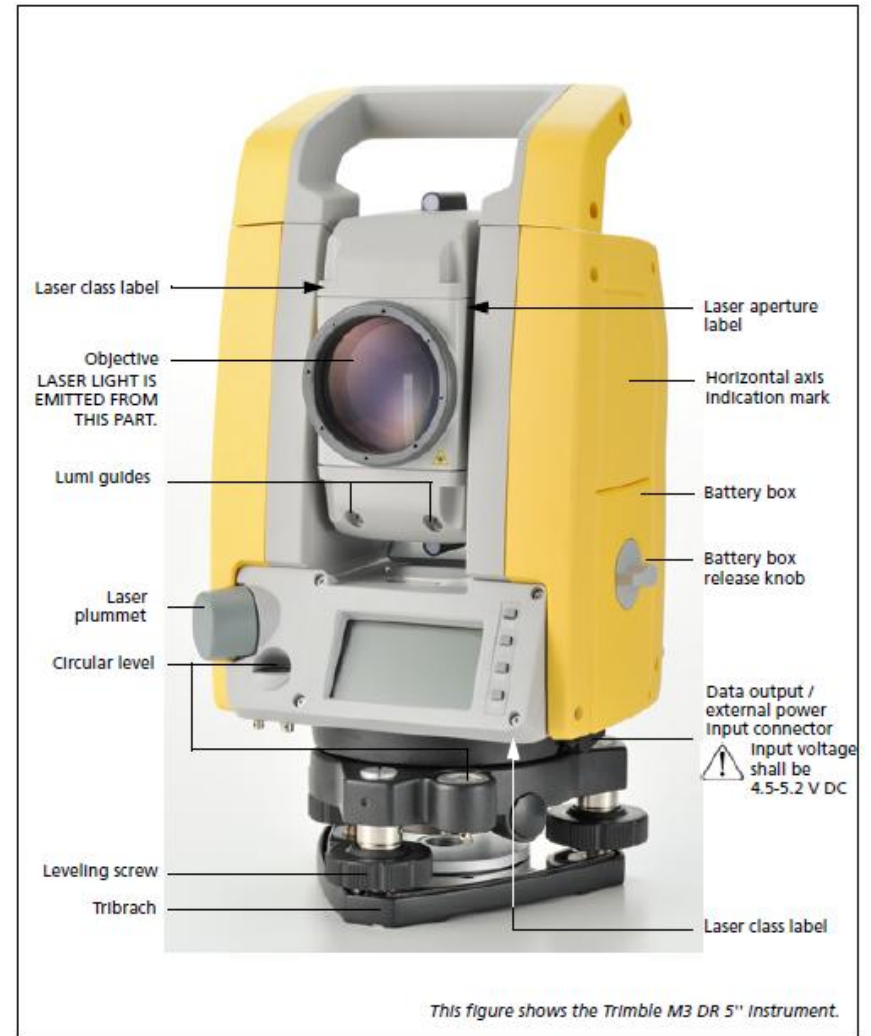This figure shows the Trimble M3 DR 5" instrument.

Figure 1.2   Trimble M3 DR Series total station – Face-2

Turning on/off M3 Total Station (TS)

- Press the Green **Power** Button to turn on TS
- The Trimble Access Screen should appear
- If the Desktop appears, double-click (tap)
  Trimble Access icon to open the application

- To turn off TS, press **Power** Button. The screen to the right
  should appear
- Tap **Standby** button to turn off the instrument
- Tap **OK** to close the screen or Press Power button to return to
  previous screen.
- Please check battery life before putting away TS and make sure
  Lab Assistants are notified that the battery needs charging.

Setting up tripod

1. Open tripod legs enough for instrument to stay stable.
2. Ensure that the tripod is directly over station point. Look through the center hole of the tripod head to check to see it is over the station point.
3. Firmly press tripod legs into the ground.
4. Level the top surface of the tripod head.
5. Securely fasten the thumb screws on the tripod legs.
6. Place the instrument on the tripod head.
7. Inserth the tripod mounting screw into the center hole of the base plate of the instrument.
8. Tighten the tripod mounting screw. *(Do NOT carry the instrument while attaced to a tripod)*

Centering using laser plumment (Do NOT look into the laser directly)

1. After setting up tripod, turn on TS.
2. Click General Survey.
3. Click Instrument (bottom right of six large icons) and then click Electronic Level. Laser Pointer will automatically turn on.
4. Align the laser pointer to the station point. To do this, turn the leveling screws until the laser pointers is over the station point.
5. While supporting the tripod head with one hand, loosen the tripod leg clamps and adjust the legnths or the legs until the air bubble is in the center of the circular level.
6. Tighten the tripod leg clamps.
7. Level the instrument as shown on the next page.
8. Check that the laser pointer is over the station point.

9. If the station point is off center, do one of the following:
   a. If the station point is slightly off center, loosen the tripod mounting screw and then center the instrument on the tripod. Use only direct movement to center the instrument. Do not rotate it.
   b. When the instrument is centered, tighten the screw.
   c. If the dispacement of the station point is major, repeat this procedure from Step 1.

Leveling

When you level the instrument, you make the vertical axis of the instrument exactly vertical. Use the electronic level as explained in steps 2 & 3 in Centering. Always set the instrument with the Face 1 direction towards you.

1. Make sure you have the electronic level on and that the Face 1 is facing towards you.
2. Rotate the alidade (if necessary) until the bottom edge of the keyboard panel is parallel to the two of the leveling screws (B and C).
3. Use the level screws to move the bubble into the center of the electronic level.
4. Rotate the alidade approximately 90º.

5. Use the leveling screw A to move the bubble into the center of the electronic level.
6. Repeat Step 1 through 5 to center the bubble in both positions.
7. Rotate the alidade 180º.
8. If the bubble in the electronic level remains centered, the instrument is level. If the bubble moves off center, adjust the electronic level.
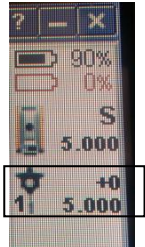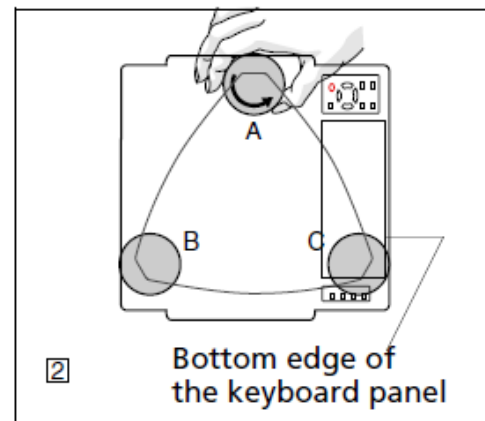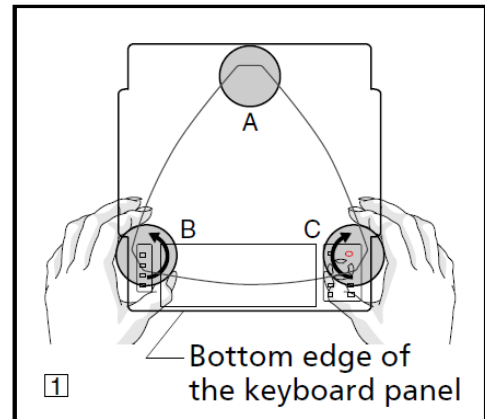
<u>Jobs</u>

Create a new job:

1. From General Survey main menu, tap Jobs, then New job.
2. Enter in name for new job using keypad on right hand side. Click the alpha button (below the Green Power button) to change letters to upper or lower case or numbers.
3. Leave Template and Coord. sys. as default values (Default and Scale: 1.0, respectively).
4. Tap the Units button to change units to US Survey Feet if not already set. Under Distance and grid coords: tap and change to US Survey Feet. Do the same for Height:.
5. Make sure Angles: is DDD.MMSS. Tap 1/3 box an lower right hand corner of screen.
6. Change Area: to Square US Survey Feet. Tap 2/3 box an lower right hand corner of screen.
7. Leave the rest as default and Tap Accept at the bottom right hand corner of the screen.
8. Tap Feature Library button. Click GlobalFeatures or corresponding Feature Code Library. Tap 1/2 button.
9. Leave the rest as default unless a Description or Notes should be added and tap Accept to save job.

To open or delete a job:

1. From General Survey main menu, tap Jobs, then Open job.
2. Tap plus butto to expand folder and display the files within the Geoline folder.
3. Tap the job name to open or highlight job name and tap OK.
   The job name appears in the title area of the main menu.
4. To delete the job, highlight the job name and then click the X button (fourth from the left under Select job).

<u>Basic Measure (Angles and Distance):</u>

1. After creating a job or opening a job, tap Instrument, then Survey Basic.
2. A screen for corrections will appear. Tap Accept.
3. The screen will have a Horizontal Angle (HA), Vertical Angle (VA) and Sight Distance (SD).
4. To measure a prism, on the right hand corner of the screen, ensure that the prism icon (Target #) is chosen as shown in the figure to the right.
5. In measuring any object that is not a prism, ensure that the reflectorless mode (Target DR) is selected as shown here.
6. Determine where HA will begin and tap Zero, at the bottom left corner, to zero out HA. From there swivel or rotate the alidade to the object to be measured. Use the Optical sight (Finder) to determine place object in sight of the Total Station. Adjust vertical and horizontal sight finely using the vertical tangent screw and the upper plate tangent screw, respectively.
7. Once object is in crosshairs through the telescope eyepiece, tap Measure on the bottom right hand corner of the screen and wait for value.

Adding Points (and Control Points):

1. In General Survey main menu, after a job has been created or opened, tap Key In. Then tap Points.
2. Enter in point name with keypad.
3. Tap Code and select Feature Code corresponding to point.
4. Add Description if necessary using keypad.
5. Enter Northing, Easting and Elevation values.
6. Tap Control Point? Box if point is a control point, leave blank otherwise.
7. Tap Store at bottom right corner.
8. Continue to add points until all necessary points have been added to start survey.

Topographic Surveying:

1. In the General Suvey main menu, tap Measure, then tap Station setup.
2. A corrections windon will popup, tap Accept.
3. For Instrument point name, tap the arrow by the corresponding box and then tap List. From the list, tap on the control point that your TS is currently on.
4. Using a tape measure, measure the instrument height from the ground to the eyepiece. Enter that value into Instrument height on the screen. Then tap Accept.
5. Next, a Backsight point will be prompted on the next screen. Tap on arrow next toBacksight point name and tap List. Choose the Backsight point from the list. Ensure that a prism icon is set and that the TS is properly sighed onto the backsight prism.
6. Tap Measure.
7. Once measured, tap on the Backsight height and enter in the height of the prism.
8. Tap Store and wait to hear "Station Setup Completed."
9. If you aren't returned to the General Survey main menu, go to it. Tap Measure and now tap Measure topo (notice options have changed after Station setup). Change from prism to DR when necessary.
10. Tap Point name and enter in name.
11. Tap Code and enter in Feature code for the point. Tap Description and enter it in, if necessary.
12. Tap Method and change depending on method required.
13. Tap Measure. Enter in any remaining information if prompted and tap Accept if prompted.
14. Wait to hear "Observation Stored."

Adding Targets (up to 8 targets):

When using multiple prisms with different characteristics, it can help to have them entered into the TS.

1. To add target, tap the prism icon or the DR icon. A list of tragets will appear (as you can't change the names of the Targets, make sure you have written down which target applies to which prism).
2. Tab on the height of any target. A new screen will appear allowing the user to change the height and constant. Tap Add at the bottom to add a new target.
3. Tap target height to enter in height and tap prism constant to change that. Tap Add to add more or tap Accept when done adding all targets. Retap the prism icon to see list of all targets.

<u>Stakeout:</u>

If you have already done Station Setup, you can skip steps 1 - 8.

1. In the General Suvey main menu, tap Stakeout, then tap Station setup.
2. A corrections windon will popup, tap Accept.
3. For Instrument point name, tap the arrow by the corresponding box and then tap List. From the list, tap on the control point that your TS is currently on.
4. Using a tape measure, measure the instrument height from the ground to the eyepiece. Enter that value into Instrument height on the screen. Then tap Accept.
5. Next, a Backsight point will be prompted on the next screen. Tap on arrow next toBacksight point name and tap List. Choose the Backsight point from the list. Ensure that a prism icon is set and that the TS is properly sighed onto the backsight prism.
6. Tap Measure.
7. Once measured, tap on the Backsight height and enter in the height of the prism.
8. Tap Store and wait to hear "Station Setup Completed."
9. Ensure that all stakeout points have been added through the procedure of adding points, as listed earlier. If there are a large number of points to add, or you need to add them prior to starting in the field, use the following steps under "Adding Points through Trimble Business Center" on the Download Handout.
10. Tap Stakeout>>Points. Tap Map to see all the points displayed on a map that have been entered.
11. Tap to select the first point (i.e. Point 1), and then tap and hold until an options list appears. Tap Stake Out point and adjust the station horizontally and vertically as instructed on screen.
12. Make sure Target is listed as prism.
13. Once you have your point staked out, tap Accept. A new screen will appear to "Confirm staked deltas." Enter in a new name in the As-staked name: (for example, Stake_Pt1). Add the feature code, if necessary and then tap Store. Wait to hear "Observation Stored."
14. On the map, you should your As-staked point and how close it is to the point on the map. If the points are far from each other, redo the stakeout. If not, move to the next point and follow steps 11-13 for all remaining points.
15. On the map, tap the + button to zoom in, tap the – button to zoom out and tap the hand to pan the map. Tap the hand button again to deselect the pan. If you select two points and you meant to select only one, tap the point you DO NOT want and it will be deslected.
16. Once competed, tap Esc from the map and Esc again from the Stake Out Point window.
17. Tap Jobs>>Point Manager to see all your points and the staked out points. Make sure each point has a corresponding point that was staked out before putting away TS.

Feature Code Library (GlobalFeatures):

Name	Description
ACP	AcPad
AW	Awning
BA	BridgeAbutment
BC	BackCurb
BLDG	Building
BP	BarrierPost
BRSH (A)	Brush
BSH	Bush
BT (A)	BroadleafTree
CBI	CatchBasinInlet
CL	CloseLine
CLM (A)	Column
CMH (A)	CommMH
CMP (A)	CommPedistal
CNP	ControlPoint
CP	ConcretePad
CT (A)	ConiferTree
DI (A)	DrainInlet
DISK (A)	SvyDisk
DK	Deck
DW (A)	Driveway
ELC (A)	ElecConduit
EM	ElecMeter
END	EndLine
ENTA	EndNonTangentArc
EMPT (A)	EdgePvmt
ET	ElecTransformerPad
ETA	EndTangentArc
ETB (A)	ElecTransformerBox
FH (A)	FireHydrant
FL	FlowLline
FP	FlagPole
GB	GradeBreak
GLT (A)	GroundLight
GM (A)	GasMeter
GPR (A)	GasPipeRiser
GR	GuardRail
GT	Gate
GUT	Gutter
GUTL	GutterLeft
GUTR	GutterRight
GWA	GuyWireAnchor
GWP	GuyWirePole
HCR	HCRamp
HDG	Hedge
HH	HandHole
HW	Headwall
ICB	IrrControlBox
IG	DoNotJoinLine
IP (A)	IrodPipe
IR (A)	IronRod

JPT	JoinToPointNumber
LP (A)	LightPole
LSE	LandscapeEdge
LSTB	LSTimber
NAIL (A)	Nail
NG	NaturalGround
OHE	OverheadElec
PB	PhoneBooth
PLC (A)	PipelineCahode
PLD (A)	PipelineDepth
PLE (A)	PipeineExposed
PLM (A)	PipelineMarker
PLMT (A)	PipelineMeter
PP (A)	PowerPole
RB	RoadBarrier
RCL	Centerline
RPR	RipRap
RWAL	RetainingWall
SCP (A)	OtherSvyCtrl
SL	SanSewerLine
SMH (A)	SanitaryMH
SNTA	StartNonTangentArc
SP (A)	SignPost
SPHD	SprinklerHead
SSL (A)	StormSewerLine
ST	StartLine
STA	StartTangentArc
STMH (A)	StormMH
STMP (A)	StormPipe
STP	Steps
SW (A)	Sidewalk
TC	TopCurb
TI	TrafficIsland
TOED	ToeDitch
TOEL	ToeLevee
TOPD	TopDitch
TOPL	TopLevee
TR	Tree
TSB (A)	TrafficSignalBox
TSP (A)	TrafficSignalPole
VEGL	VegLine
WE	WaterEdge
WIRF (A)	WireFence
WL	WaterLine
WLK (A)	WalkPath
WM (A)	WaterMeter
WODF (A)	WoodFence
WV (A)	WaterValve
WW	WingWall

*(A) - involve attributes associated with the code that will need to be filled in if applicable.