**Digital Land Surveying And Mapping(DLS&M)**

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**Lecture - 17**
**Total Station**
**Introduction**

Welcome students, this is the lesson number 17 in which I will introduce you to total station. Actually in surveying while we go for land surveying work we do measure, the distances and the angles. Among the distances also we do measure horizontal distance, vertical distance and we want to measure horizontal angle, vertical angle. Now in conventional methods actually we make use of different type of instrument for different type of measurement which is sometimes cumbersome, sometimes we end up with data we having different accuracy. So, using those type of data in surveying work we will not end up with good result. Further in conventional methods also we have to go for a lot of office work to reduce the data useful for preparation of the map or the purpose for which we will be using surveying data.

Now, in order to avoid all those cumbersome steps and the physical work in carrying out the computations and reduction of data, we nowadays use one instrument called total station which has the capability to measure, reduce, then store the data automatically. So, in this class we will be learning about what constitutes the total station is, how does it look, I will tell you about different parts of the instrument.

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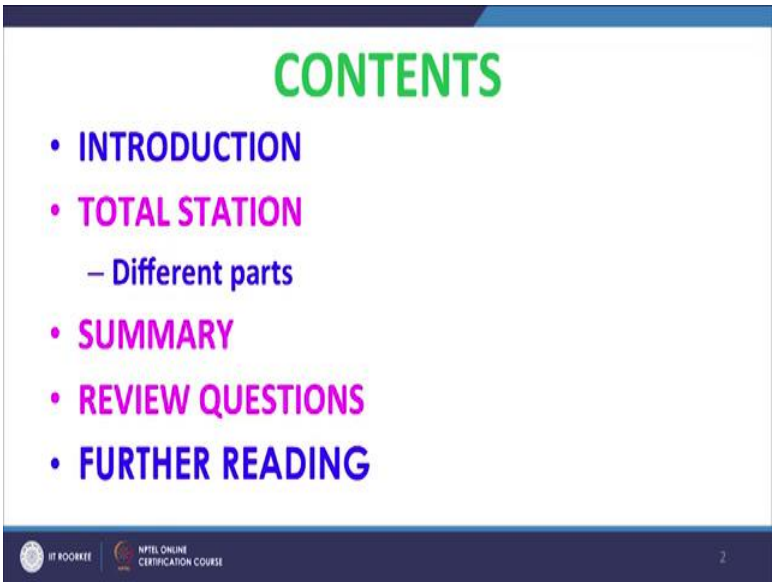


And this lesson is will be like introduction followed by I will show you the total station and then I will tell you about the different parts of the instrument.

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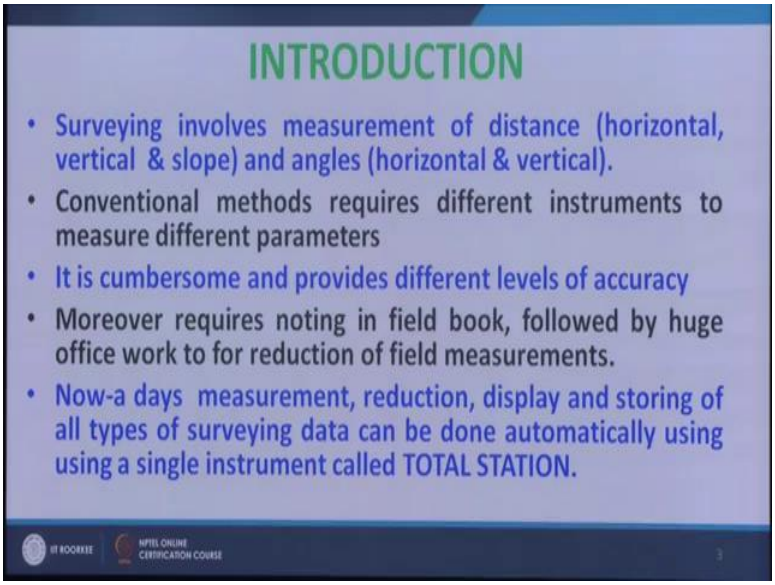


So, as I told you surveying involves measurement of distance and angles and conventional methods require different types of instrument which is of an cumbersome and provides different levels of accuracy. Further in conventional methods we need to have field book followed by the office work. So, all these works we can do in a single go automatically by using a instrument called total station. In fact, in total station we get all

the surveying data in digital format also. So, it will be convenient for us to transfer the data from the instrument to the computer or to the mapping software to prepare our map or to do some other design work for surveying parameters are required. So, we use total station to collect the field data. In fact, we make use of GPS what you have already learnt to establish the control point and those control points are transferred to total station, after transferring the control points to total stations we make use of total station to collect the other field data.

So, actually a total station is an instrument which is basically an electronic instrument also have some optical features. Fundamentally it is an electronic theodolite and in which we have an optical telescope as well as it is integrate with an electronic distance measuring instrument idiom and also it is interfaced with some microprocessor and many of the accessories like keyboard, display, unit, then data collector also it is associated with a field computer, ultimately field computer (Refer Time: 04:30) field computer all the works is being done.

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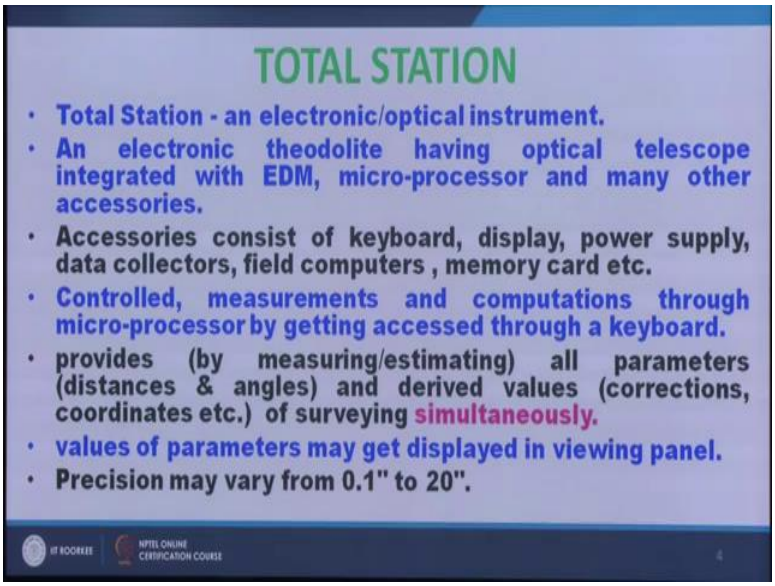


And in the inside the total station actually a microprocessor which really controls all the operations of the different parts of the instrument it is the microprocessor which makes the measurements and also using microprocessor we do carry out the computations; that means, our total station carries out the computations and finally, it provides all our final measurement parameters like horizontal distance, vertical distance, slop distance,

horizontal angle, vertical angle the location of point all these thing we do get directly from total station and that is available for us in the display unit as well as it gets stored inside the memory of the total station.

Now, these the total station actually vary there are different types of total station actually depending upon how good or how bad it carry out the measurement; that means, it is the total station carries out the measurement by using some circle reading.

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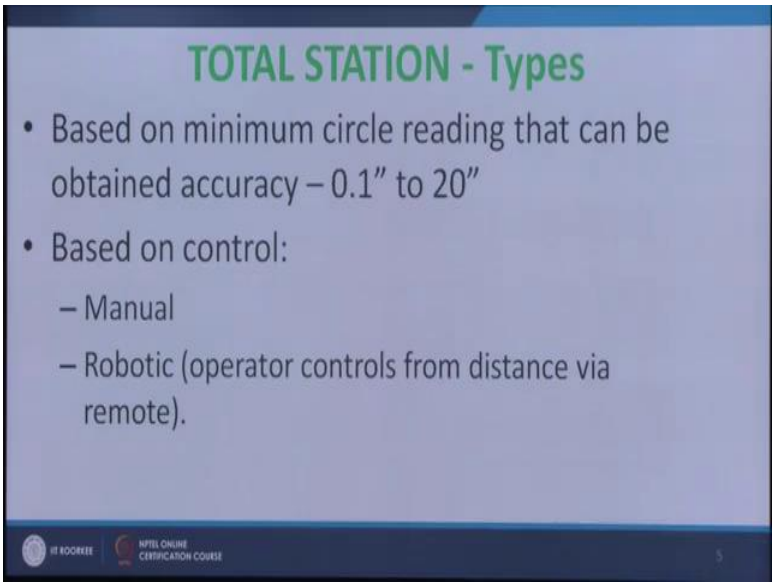


And how, accurately how precisely what is the amount it can, what is the little amount that means, what is the least count of that circle reading that defines the type of total station. Some variety of total station may measure or have the least count as least as 0.1 second and some variety may be as big as 20 second. So, in between there are any value like 1 second total station, 2 second total station, there may be 5 second total station, there are 15 second total station, 20 second total station like that.

So, depending upon what is the least count of circle reading the type of total station depends, this is one variety another variety is based on again we can classify the total station based on the control. That means, what is the basis or how do total station operates; that means, total station can be operated manually; that means, a person will personally work out carry out the work, give the provide the commands and do the things in the field that is called manual total station and most of that total stations are manual in

nature and there are some total station which is tumbled as robotic actually robotic type of total station will be can be operated from remote area then some distance.

So, we do take measurement using robotic total station in the advantage of having the robotic total station is that it will identify or locate the sensor automatically at the instruction of the operator who which who will be holding the sensor. So, with this background I would like to now show different types of total stations.

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Now, this is one of the total varieties of total station actually this is having an accuracy of one second; that means, we will, this total station can read a reading up to one second. Now this is one more verity of total station which I told you that is the robotic total station this total station rotates office one through motor and using the sensor it will rotate automatically to find out the sensor and take the reading. So, this is a robotic total station.

Now, this is one more total station which is of manual type this total station is having an accuracy of 5 seconds. Now I will explain in detail about this total station this is a manual type of the total station and the accuracy of this is 5 seconds and in future we will do all our work or demonstration using this total station. Now as I told you that the total station is an electronic theodolite, now you know in a theodolite there are two there is a standard. So, this is the standard equivalent to our conventional theodolite and this is the vertical circle and there is a horizontal circle here.

Along with this electronic theodolite there is an idiom, so this is the idiom actually the idiom in total station is capped and around the telescope of the theodolite. Now this is the objective lens, this is the objective lens of the theodolite and telescope and this is the eyepiece and in this telescope this is the focusing scope. So, you can see we this telescope can rotate about axis which is called trunnion axis that is an imaginary line about which this telescope can rotate in a vertical plane that is called trunnion axis.

Now, in this total station this is the vertical circle knob main screw, if I fix it then the our telescope will be fixed and if we want to move fine adjustment telescope then we have to use this is called fine tuning articles circle now. So, now, if I open it the telescope will be able to move around the trunnion axis about the trunnion axis now this knob, this knob is the horizontal circle fixing knob if I fix it then it will not move. So, if we open it the whole of this assembly will move about a vertical axis passing through this point. So, like this and this is required for horizontal angle measurement. Now if I fix this knob then there will not be any movement, now after fixing this in knob if we want to have fine tuning of horizontal angle measurement or about the vertical axis knob when you need fine movement then we can use this knob.

This is a, this is used to see whether our instrument is just about the center or not. The microprocessor part is inside this instrument. So, it will not be we will not able to see it; however, this is the part display and this is the keyboard using this keyboard making it on make using this keyboard we can give different instruction to this total station to carry out. Now apart from these you can see actually if the whole of total station there are two pars - one is above this and this bellow one this is called tribrach portion and this instrument is fixed, now it is a fixing lock, this fixing lock when it is, it is locked. So, our upper part is locked with the lower part, now if we open this lock then we can take out this upper part from the lower part. I will later tell you what is the use of that and with these tribrach there are three foot screws these are the foot screws these foot screws are used to layered instrument and these foot screws are rest on a plate called base plate and this base plate is used to fix with this tripod stand.

So, apart from that there are so many other small parts like this is called handle. So, as it can be seen and (Refer Time: 14:31) it is very easy to say that this handle is used to carry the instrument, then here there is an arrangement though in this instrument we do not

have, but we can fix some antenna here which is called bluetooth antenna. In this figure you can see it.

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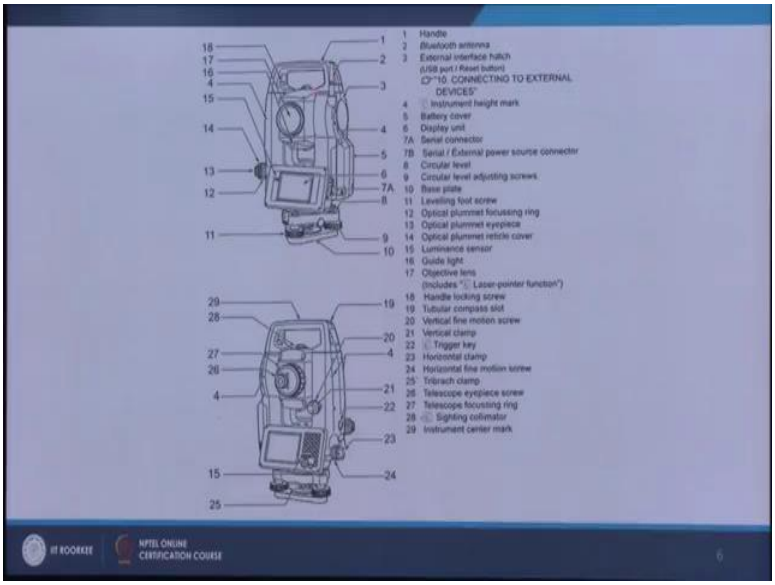


This is the bluetooth antenna which is not there in this instrument. So, it can be fixed there similar to this kind, then this is a thing like number 3 external interface h. So, if we want to fix any external USB and all these thing we can fix it at this point. So, this is the external interface h. There is a mark here you can see this mark provides the heart of the instrument heart of the instrument above this point. So, this is fixed we can measure from this point to this point we know and from this point to this point we measure, so then we can get the heart of the instrument.

And this is the battery cover you can see here this is the battery. So, we can if we want to take out battery for charging on other purpose we can open it and then take out it and the otherwise we can keep it and fix it, this is the battery cover. So, and already I told you this is the display unit, now you can see here this display unit is with the keyboard, but other side this displays unit without keyboard the reason mainly is that the aparter will do this in this direction and any other person who will be able to see many other (Refer Time: 16:44) to see really what it is going on.

So, there is no need to have both way keyboard then our serial connector here you can see this is the serial connector. So, generally it is used to download or upload the data, download the data from the instrument to computer or sometimes from computer to our

instrument. Then there is a circular bubble here, so you can see here there is a circular bubble which provides us whether our instrument is level or not in case it is level then the circular bubble will be at the center by in that way I will be able to know whether our instrument is properly levelled or not.

And this is a part which is for permanent adjustment; that means, if there is something wrong with the circular bubble in construction defect or some other problem arise. So, the in the machine, in the (Refer Time: 18:10) or in the lamp this may be used to correct those permanent adjustment. Optical plummet already I told you that this is the optical plummet, this is the optical plummet and this is the optical plummet from as a focusing screw, this is the eyepiece of the optical plummet.

Now, one more thing, in this you can see this part, this part this is the that luminance sensor. So, this is used this luminance sensor find out what is the luminance around depending upon that automatically the brightness of the screen goes up or down makes it down depending upon your need. Then 16 guide light here, now here is a part actually this is the called guide light. So, whenever we will like to see some object first approximately we will look through this to approximate the object bisect the object, now approximately when we will see that we have reached arrived at the object then we may look through our telescope to actually bisect the thing once the object is bisected then we will fix up the horizontal fixing screw then again focussing it properly using the pine horizontal screw we will exactly bisect the object.

Then objective lens already I have told you this is the objective lens of the telescope; that means, the lens which will be facing towards the object that is the objective lens and the lens which will be facing to the instructor or the observer or the operator that is the eyepiece and the line.

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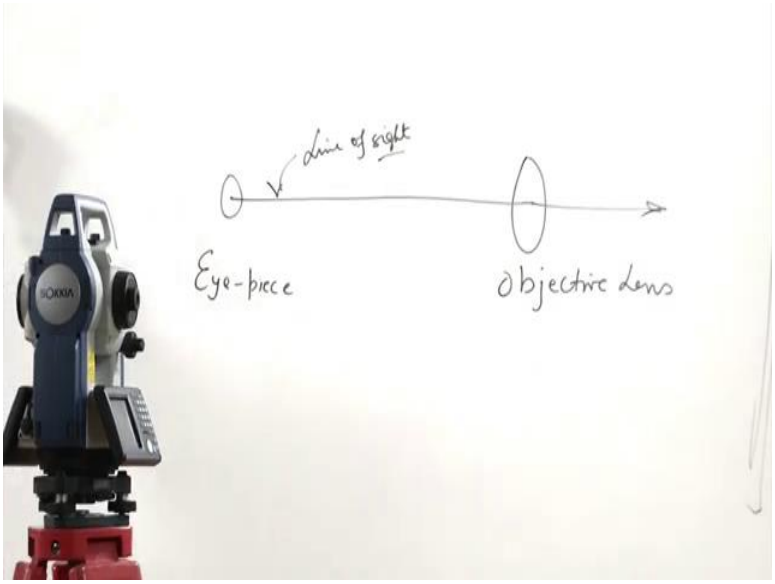


So, there are two lens - one is the objective lens which will be pointing towards object and another is the eyepiece lens. The center of this and the center this if we joint we will get a line that is called the line of sight. So, this is another important line. So, we got tilting axis, tilting axis is a line imaginary line about which the telescope rotates in a vertical plane then vertical axis it is the line imaginary line passing through these instrument and passing through this station center about which the instrument rotates in a horizontal plane and the line of sight is the line along which the observer looks through to get the object identify.

These are the three important lines which are will be using in feature more and more tubular (Refer Time: 22:17) actually there is a slot where we can go for computer, tubular computer can be tubular compass can be erected, but not available here now. Vertical fine (Refer Time: 22:34) screw or vertical clamp as I told you this is the vertical clamp screw. So, if I clamp it the telescope will not move if you open it telescope will be (Refer Time: 22:46) in a vertical plane this is vertical clamp screw and this vertical clamp fine screw.

Then similarly this is the horizontal clamp screw and this is the horizontal clamp fine screw, then tribrach clamp as I told you this is the tribrach clamp which will clamp the upper part of the instrument with the lower part. If we open it then upper part can be taken out this is generally used for keeping the centering of this tripod stand on the

station and if you want to use different instrument on the same point on the same station then this we want to keep as it is only we will like to take out this instrument and we will I like to fix a new instrument. So, for that purpose this clamping screw is useful and we do it, we make use of that clamping screw tribrach clamp in that way.

Setting collimator that is the setting collimator and then your instrument center mark, actually there is a point here which is called the instrument center mark. We assume whenever this instrument is properly levelled and properly centered about the station then the vertical axis will pass through this point and the center point of the station. So, this is the vertical axis line will pass through this point and this instrument station location. So, in short I had given some definitions like this.

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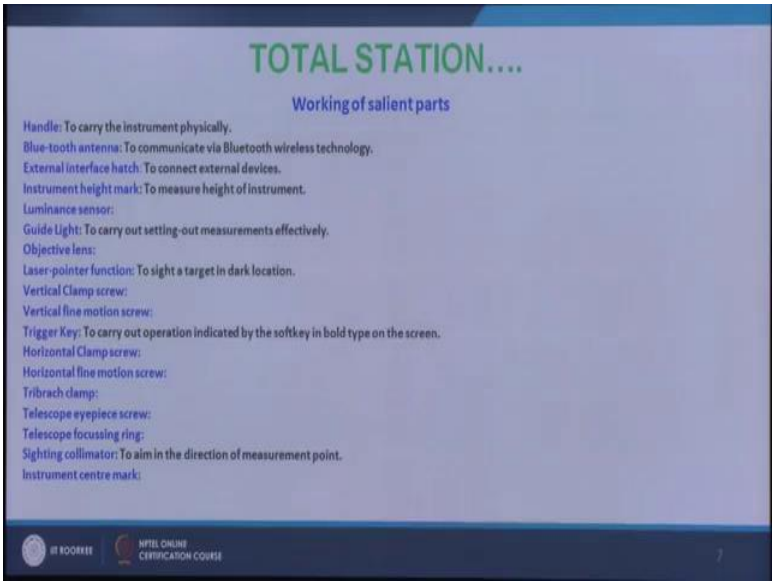


So, with this I will like to conclude about the interaction to total station, actually total station is an integrated instrument electro, electronic cum optical instrument its angle measurement, horizontal circle angle measurement, vertical circle angle measurement are done using electronic concept, electronics making use of some electronics equipments and the sighting or bisecting the object is done optically through using this telescope and it makes use of some microprocessor to get command to this, to give instruction to the instrument to carry out, to measure the, to take measurement, to reduce the data to for computation and to store the data in the computer memory.

So, total station is an integrated instrument which can measure reduced data, measure observation, reduce data, compute data and store data in digital format. Nowadays this total station is extensively used or surveying work construction surveys land surveying all these thing. In this course we will make use of this instrument to; we will learn how to make use of this instrument to collect all other field data. With this I like to conclude.

Thank you.