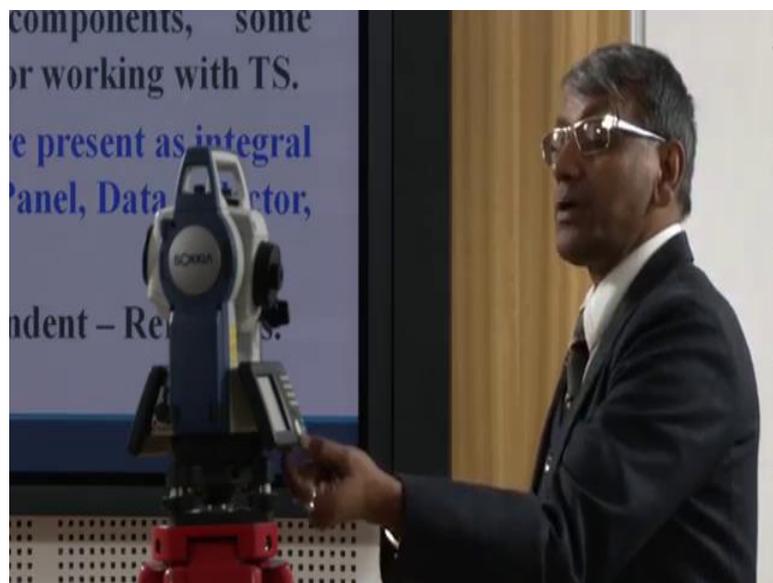


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Lecture – 19
Accessories of Total Station

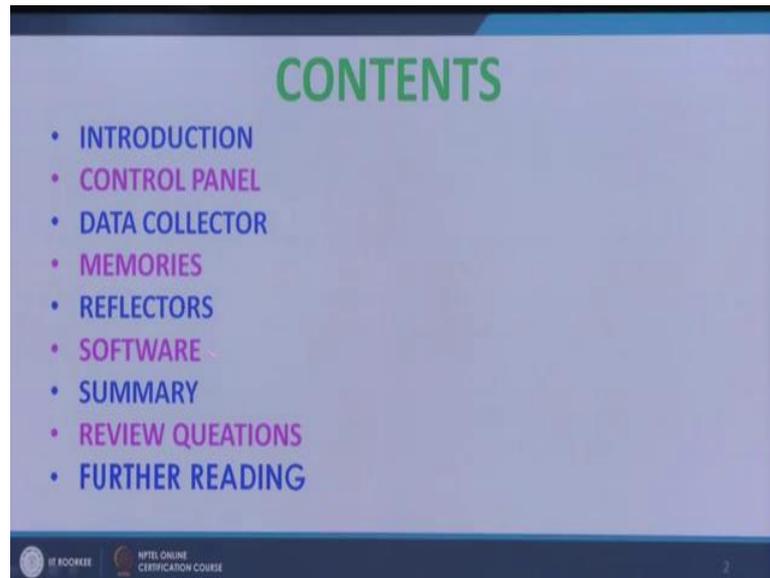
Welcome students, today is a lesson number 19 in this lesson I will be discussing on the various accessories that had to be used along with the total station.

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Now, already we have discussed about the total station which primarily contains or it is an integrational unit of electronic theodolite then your EDM instrument and the microprocessor of the computer that has been already inbuilt within this instrument; is again to operate these primary units we need to have some very small parts like this screws and then drag on all this thing tripod stand that we have discussed in the last class. However, for to carry out the work more automatically or to complete the work easily, we need to have some more accessories to be associated with the total station and some of them are integrated with this unit and some of them are independent of this unit.

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So, today I am going to discuss on those accessories; the accessories which are very important to work with the total station or control panel. Already a little bit of this we have discussed in last classes then there is a data collector then we need to have some memories inside this station instrument then reflectors and software these are the different five units which I will discuss today.

So, I have told you that there are five accessories which I will be discussing today and some of these accessories are integrated with this total station and like the control panel and within this control panel actually some element called data collector is also there and sometimes these data collector maybe external. So, it varies from system to system most of the total station is also associated with memories to store the data and those memory may be internal memory as well as in some instrument there may be elements for external memory using memory card.

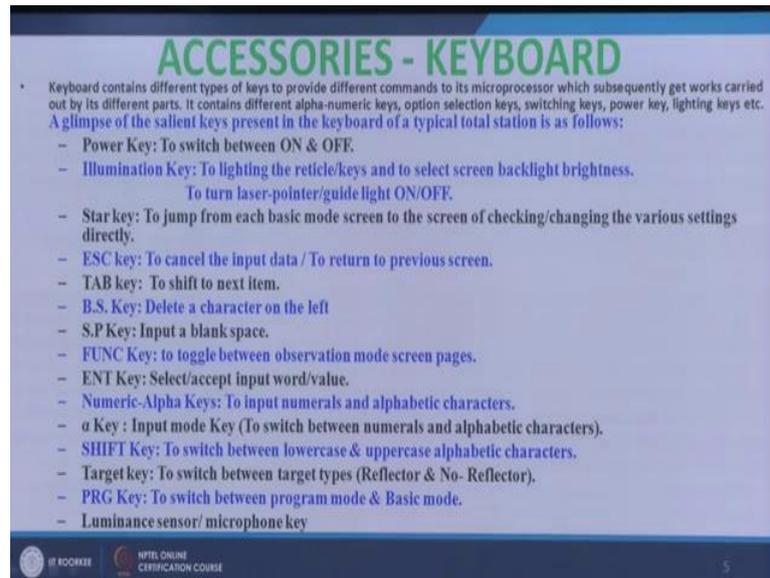
Then some reflector which is also allows independent of these total station, so I will be discussing let me start with the control panel. Now control panel of total station basically consists of a keyboard and a display unit, this is a multiple layer line liquid crystal display LCD this one and a keyboard these are the different keys which constitute the keyboard. Now these keyboards or these keys are used to provide different information or to carry out different work by this instrument by the total station. Now in this keyboard actually there are different types of keys are available which I will be

discussing and depending upon the nature of the key which we will press, the total station will carry out the work.

Now, in some cases this keyboard is fixed with instrument and in some other cases this keyboard along with the data collected may be independent of this unit and in those cases we may replace this part to some other instruments. Suppose, I am using this total station at this location and I have collected the data using this control panel. Now I want to make use of the data of the total station with some other instrument, so I can take out the part of this data collector or along with this control panel and I can replace this data collector along with the control panel to some other instrument, so to make use of the same data. So, that is the flexibility we have when we have the independent control unit.

So, basically this keyboard and this display unit are the components of control panel; now as I told you this keyboard contains different types of keys and depending upon the keys which we press the information or the action we can do, the total station will carry out. Now the among these keys now the salient keys are like this, so here you can see the green one if we press it then the instrument will be made on. So, as soon we are pressed it this is made on and some menu will come here, then this is the elimination keys this is elimination key if I press it you can see that the we will be able to get the elimination of this LCD display then our star key this star key, now if you press this star key you can see that we can change the mode of this now it is a some other mode and we can change to some other mode here. So, now, you can select the mode which would like to do.

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So, star key is primarily used to change or jump from each basic mode screen for checking or changing various set setting directly. Now this is the escape key; now this escape key used to for input of data now you can see that we are that is all some to return to the previous screen. So, if I want to previous screen we can now it you see that we have return to previous screen. So, escape mode is used to cancel the input data or to return to previous screen.

Now, tab this is a tab key if we press then we will be able to shift to next item then our b s key, this key deletes a character on the left and SP is a key that provides the inputs space. So, different keys has different function like function key, I have a function key here which may be used to toggle between observation mode screen pages. So, you can see here that if I use this thing suppose this one different, so after that I can select enter; so I can do it.

So, by entering we can carry out by functioning function key we can choose the function to be done by entering that work would done. So, now the there are so many keys which are alphanumeric in nature. So, same keys will be used for giving the alphabets or it may be numerical, but this key which is call alpha key; if we press it then the input mode will be decided whether we will like to go for numeric mode or in the alphabetic mode. So, after pressing this alpha key we have to shift if we choose for the alphanumeric keys

alphabetic keys then we have to press the shift key to get the uppercase or lowercase alphabets.

Now, here is a key called target key if we press this key then we can choose the target whether it is a reflector or without reflector. So, this is called target key then there is a key called program key PRG, so this will take us from basic mode to program mode or program mode to basic mode. So, we can change the mode of this our observation by pressing these PRG key, so in that way there are different keys we need to know about the function of different keys before we go for operation and so with this slide keyboard I had discussed this is the pictorial be this is the actual keyboard and this is the pictorial preview of this whatever I had discussed.

Now, each total station is also integrated with a part of the instrument called data collector. So, by the name itself we can understand the data collector is an electronic instrument which all data electronic management through which we can measure collect the observation or measurements also data collector will be used to store the measurements or observations which we will acquire automatically. Also through data collector we can provide the point identifier, suppose I have seen we have collected the data about the corner of a road so we can along with that point we can provide a code for road.

Suppose I have collected the data about the location of a tree, so with respect to tree I can provide some code. So, that type of arrangements are there with the data collector and that helps in making the map better or easy in future. Now these data collector actually collects the data in either in binary format or in ASCII format. Binary format data actually are more accurate and we will be able to get more information, but; however we need to convert it to ASCII mode to download it to read it.

So, ultimately we will get the data in ASCII format; now this data collector also helps to scroll through the data. So, that we can store, we can display, we can review the data, we can edit the data and the data collector actually every specific instrument with which each and every specific instrument a type of data collector is specific. So, data collector is instrument specific that we have to be keep it in mind; however, there are some data collector also available which may be useful for different instrument simultaneously.

Specially now this data collector as I told you that data collector may be flexible type which may be taken out from the instrument and those are a bit flexible type and sometimes data collector maybe external type; that means, totally it is independent of the total station. So, simply we can connect the data collector to the instrument and we can give or through bluetooth communication, we can make use of data collected to give different command to the instrument to carry out.

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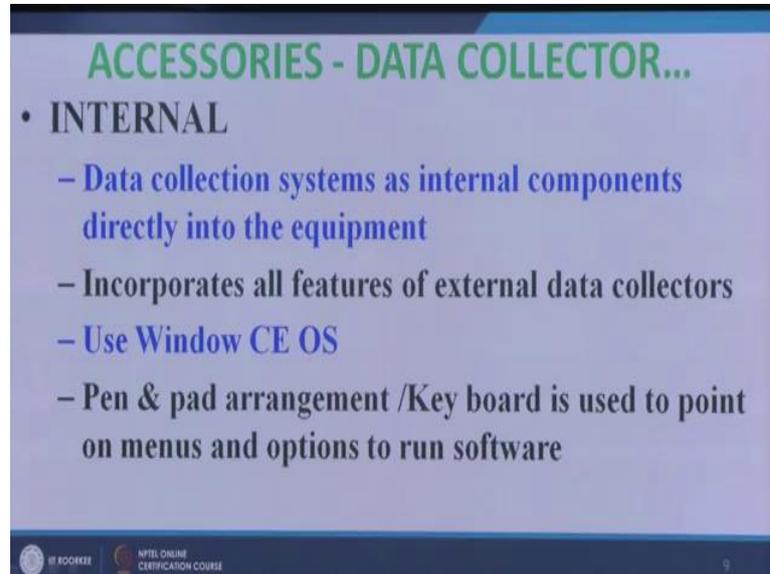


So there are two types of data collector available; one is external type another is the internal time. Now this is one of the external type of data collector, now here you can see we have the keypad here and also there are different functions that can be done inside this there are different types of software which we can make use to get the work done; also this type of external data collector have the bluetooth connectivity, through this bluetooth we can also get the work done by the total station.

So, this is an external type of data collector and it has some operating system like Windows C, operating system thus variety of windows software program can be performed through this data collector. And also inside this we have different programs which we can make use to do many calculations and for communication, with this instrument with instrument through this we can use the bluetooth technology also Wi-Fi technology and so this is a very powerful thing to make use of external type of data

collector because the same data collector may be used with different instrument and so same data may be useful.

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Another variety of data collector is the internal type, now this internal type actually they are connected with the instrument directly. Now among the internal type there may be two variety one is that fixed with instrument like this one and another this is also an internal data collector having the control unit this keyboard and the display unit which is detachable, so it is attached fixed with instrument. So, and this is detachable this type of data collect; internal data collected may be used with many other instrument and same data may be useful; similar to what we have seen for external data collector.

However this type of data collector will have less capability than the external type of data collector I have shown; that internal data collector actually have all the specifications of a external data collected and also it make use of Windows C, operating system and then it has this stylash, with the help of stylash we can do many works in it. So, whether it is internal data collector or external data collector all these data collectors provides us; automatically we can measure the different barameters then we can make use of data collector to process display or archive fields notes in office reduce significantly so that there are different advantage of using the data collector.

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The slide is titled "ACCESSORIES - DATA COLLECTOR..." in green text. It lists the following points:

- Advantages
 - Mistakes in reading and manually recording observations are precluded
 - Time to process, display and archive the field notes in office reduced significantly
 - Execute program in field and in real time
 - Most useful when large quantities of information is involved
- Disadvantages
 - Field data may be erased accidentally due to carelessness or malfunction of instruments
 - All information cannot be entered/stored in digital form
 - Varied data structure from different manufacturers
 - Need to be compatible to the computer/software in which data need to be considered further.

At the bottom left, there are logos for "IIT ROORKEE" and "NPTEL ONLINE CERTIFICATION COURSE". At the bottom right, the number "10" is visible.

The most important advantage is that while we do data collection using manual field notes then there may be some mistakes in reading or recording the observation, but if we make use of data collector; electronic data collector then the mistakes is expected to be done less. Then the to process display and archive field notes in the office reduce significantly, so by giving the proper code we can make the notes easily, but which is difficult to do in or it takes time consuming in our manual field notes.

Now also these data collector is actually having some computer program, so we can execute many of the programs and we can see the data on real time, we can compute the data in real time also. So, we can store the data in the memory and making use of the data collector we can collect as well as store a huge amount of information in a digital format and later those data can be easily transport or transferred to other instruments or other software and we can conduct the work fast and economically.

However there are some disadvantages with the data collector like because it is a computer based electronic based. So, if we do some mistakes in pressing any keypad or if there is accidentally there may the all the data may get lost or if the instruments malfunctions then also our data may be lost, so this is the biggest disadvantage. So, whenever we go for electronic data collector system we should be very careful in making use of that. Apart from that some of the information follow as will not be actually what

are the amount of information or what are the information will be able to put inside our data collector that is restricted.

So, many information may not be possible always to maintain in the data collector; moreover as I told you that data collectors are instrument specific. So, each data collector will have its own data structure about in which it will be maintained or stored. So, each type of whatever the data stored in any data collector, it may not be useful for many other software or many other work before that we need to convert it to the respective format.

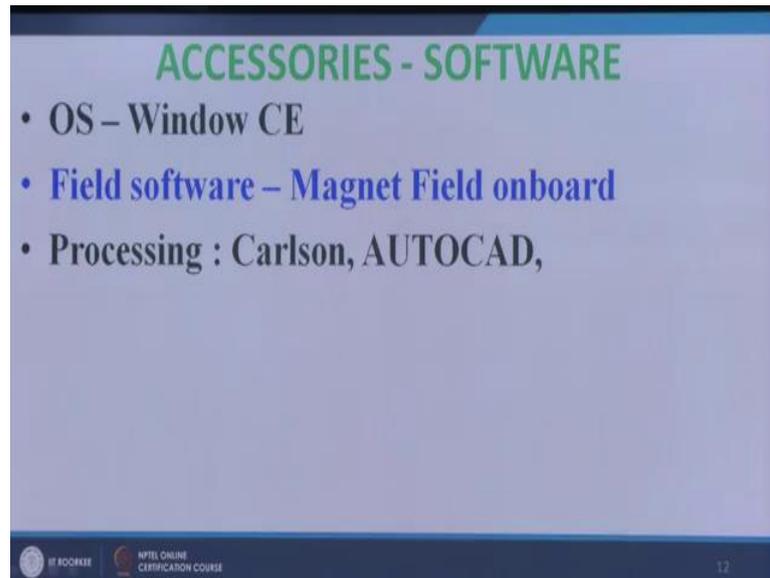
So, connect to compatible to the computer software any data need to be considered further. So, these are the salient advantage disadvantage, but; however, nowadays our computer technology all these work are so improved that these issues has been coming less and less, so we can very well make use of data collector looking into its advantages..

Next as I told you that total station it works electronically and we do measure then reduce the data then we compute the data all these thing electronic through computer programs available inside this data collector of the instrument. So, and all these data measurement data and things should be stored and this is stored inside this total station, there may be two ways how this is stored; one is that internal memory that is associated with each instrument and usually 5000 to 10000 coded points can be stored in a single instrument and with these because we are getting more and more smaller dimension and memory card so memory storage.

So, more and more data can be stored inside the computer, inside this instrument; however, there is another way how we do store is that external memory card or memory card. Now it is one of the arrangement which is the memory; external memory where which can be passed with this instrument using some code portable cord and we can also store the data externally or sometimes some memory card also kept inside this instrument. So, in that card also we can store similar to any other computer and later we can take out the memory card and we can read it.

So, the memory with respect to memory of total station there may be two types as I told you one is that internal memory that is associated with the instrument itself or in external memory.

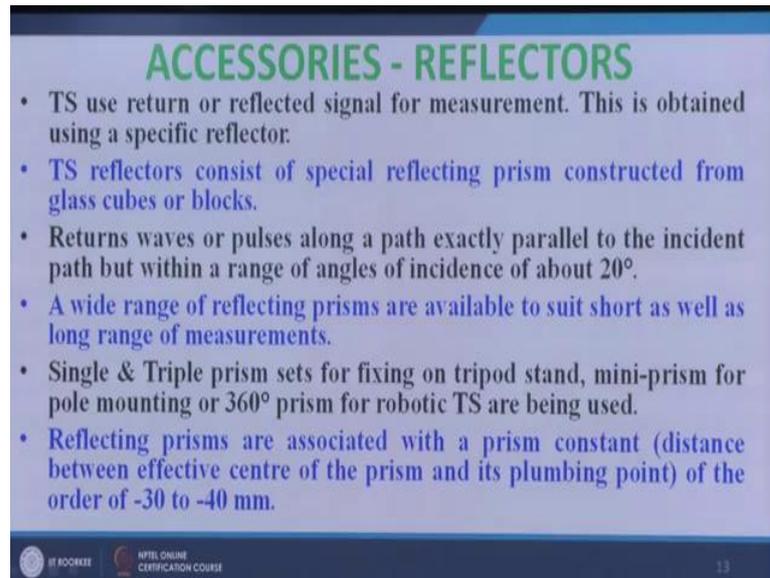
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Now, all the works of the total station finally, is got done through some software and there are three different types of software, generally we made use for collecting, operating the instrument, collecting the data and then processing the data. For each in instrument there is fundamentally software which is called operating system, within that operating system we do generally install the measurement software also called field software. So, generally we use the window C operating system and within that system actually we do in case of this instrument it is the magnet field on board, field software used in some other instrument some other field software will be used.

So these field software's are actually manufacture dependent, so different manufactures provides different types of field software and then making use of the control panel using the data collector through the software we collect the data and those data will be downloaded to some processing software. Now there are different types of processing software which is made use to arrive at the final product of the data collected and many times it is the map. So, we use generally we can use Carlson software, auto cad software then Liscad software there are many other software's. So, software ultimately it is the software which really provides us the final outputs.

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ACCESSORIES - REFLECTORS

- TS use return or reflected signal for measurement. This is obtained using a specific reflector.
- TS reflectors consist of special reflecting prism constructed from glass cubes or blocks.
- Returns waves or pulses along a path exactly parallel to the incident path but within a range of angles of incidence of about 20° .
- A wide range of reflecting prisms are available to suit short as well as long range of measurements.
- Single & Triple prism sets for fixing on tripod stand, mini-prism for pole mounting or 360° prism for robotic TS are being used.
- Reflecting prisms are associated with a prism constant (distance between effective centre of the prism and its plumbing point) of the order of -30 to -40 mm.

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And finally, the topic on reflector, so this is the indicated instrument, but this instrument take the measurement by making use of some light reflected from a reflector. So, and that is, so it is named the reflector; reflector is a part of the instrument in which reflects the light, light may be in visible or in visible bent or in infrared bent depending upon which what we made use and that reflected light we this instrument receives that and from that reflection; reflected light only all the measurements are being done fundamentally measurements of slope distance as well as the horizontal and vertical angle.

Now, this reflectors actually consists of special reflecting prism constructed from glass tubes and blocks.

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Now, let me show you some reflector as you see this is a reflector, this is a single prism reflector. So, only one prism is being used and the intersection of this line and this line gives you the exact centre of this prism.

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So, this is a single prism reflector and there maybe; there are another variety called three prism reflector in these case you can see that there are three prisms which are available in the reflector. So, depending upon our purpose these whether we may use one single

reflector or triple prism reflector, sometimes there are reflectors which are having 36 degree prism for robotic total station.

Now, these reflectors actually are placed over a tripod stand, so reflector may be placed on a tripod stand. So, like this is a (Refer Time: 27:55) which we can make use to fix on the tripod and on that we will place this. Now this is an arrangement we can do this is called fixing the prism on the tripod stand. Now here you can see that I have shifted the instrument and I had replaced the instrument using this tripod head on all these things. So, the centering as well as leveling we will not be need to do if I use that same (Refer Time: 28:36) or if I use the different (Refer Time: 28:38) then I have to centering is avoided. So, in that way we can take the reading at the same time where the instrument works.

So, now another way how these prism we generally made available in a pole; now that this pole may be kept straight by holding it or sometimes we make use of a tripod now so in the field, the reflector maybe of single prism or it may be three prism and either of them may be placed on a tripod stand like this or it may be hold on a single pole. So, now one thing important whenever we leaves the prism we must note down a constant called prism constant. So, it generally varies from 30 to 40 millimeter actually the centre of the prism and the reflecting distance, there is a distance between the effective centre of the prism and that the distance between the effective centre of the prism and the vertical line, vertical axis of this there is a difference that is called prism constant and that has to be fed to the computer before we make use of the prism, so this is the important point to be noted.

So, and that is all about our reflectors, so with this I like to conclude today's class; so we have seen that the apart from the fundamental units and small parts, we have to make use of some accessories associated with the to be associated with the total station which may be integrated to the total station or it may be independent of the total station and sometimes some accessories may be attachable or detachable. So, all these make the digital field data collection much easier and simpler. With this I like to conclude today's class and next class I will be talking on how to handle a total station and how to set up a total station before we start any observation.

Thank you.