HTD-10 AUTOMATIC VIDEO TRACKER

Datasheet

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CONTENTS

INTRODUCTION

HTD-10 is an electronic module intended to use as a part of the video processing system for automatic tracking of objects and transmitting tracking data.

HTD-10 has the following features:

1. Receiving video information from 2 video sources (automatic tracking is performed by one selected source);
2. Selecting a video source by the operator command;
3. Capturing objects to track by the operator command;
4. Reset tracking objects by the operator command;
5. Automatic object tracking (up to 5 objects) in the field of view of the video sources;
6. Providing the Customer with information about moving the objects of tracking.

HTD-10 has the following main characteristics:

1. Enclustra Mercury KX-1 FPGA module ME-KX1-325-1C-D10, for video processing;
2. Two analog video inputs (CVBS and Y);
3. One Ethernet 1000base-T;
4. Two Rs485 (up to 118200 Kb/s);
5. DC 12 V Power;
6. One Fan connector.

WORKING PRINCIPLE

HTD-10 is connected to 2 video sources (analog cameras of PAL standard). Video signal from 2 cameras arrives at HTD-10. HTD-10 digitalizes the analog signal chosen by the operator and transmits the digitized signal into digital computing unit. The images from the input video stream are recorded into the internal memory of the device. Digital unit reads the images from the internal memory and process them. The exchange of control information and status information is performed via the Rs485 interface. The device has another RS485 interface to connect the peripheral equipment. Commands from the operator arrives at the device via RS485, as well as service information and tracking object information is transmitted to the operator. When HTD-10 gets the command to capture an object, digital computing unit carries out preparation for tracking and after the arrival of the next frame search the tracking object in a certain area. The most probable position of the tracking object is defined for each frame. Information about the position of the tracking object for each channel is transmitted to the operator via the RS485 interface.

HSRDWARE DESCRIPTION

DESCRIPTION

General view and interfaces of HTD-10 are shown in Figure 1.

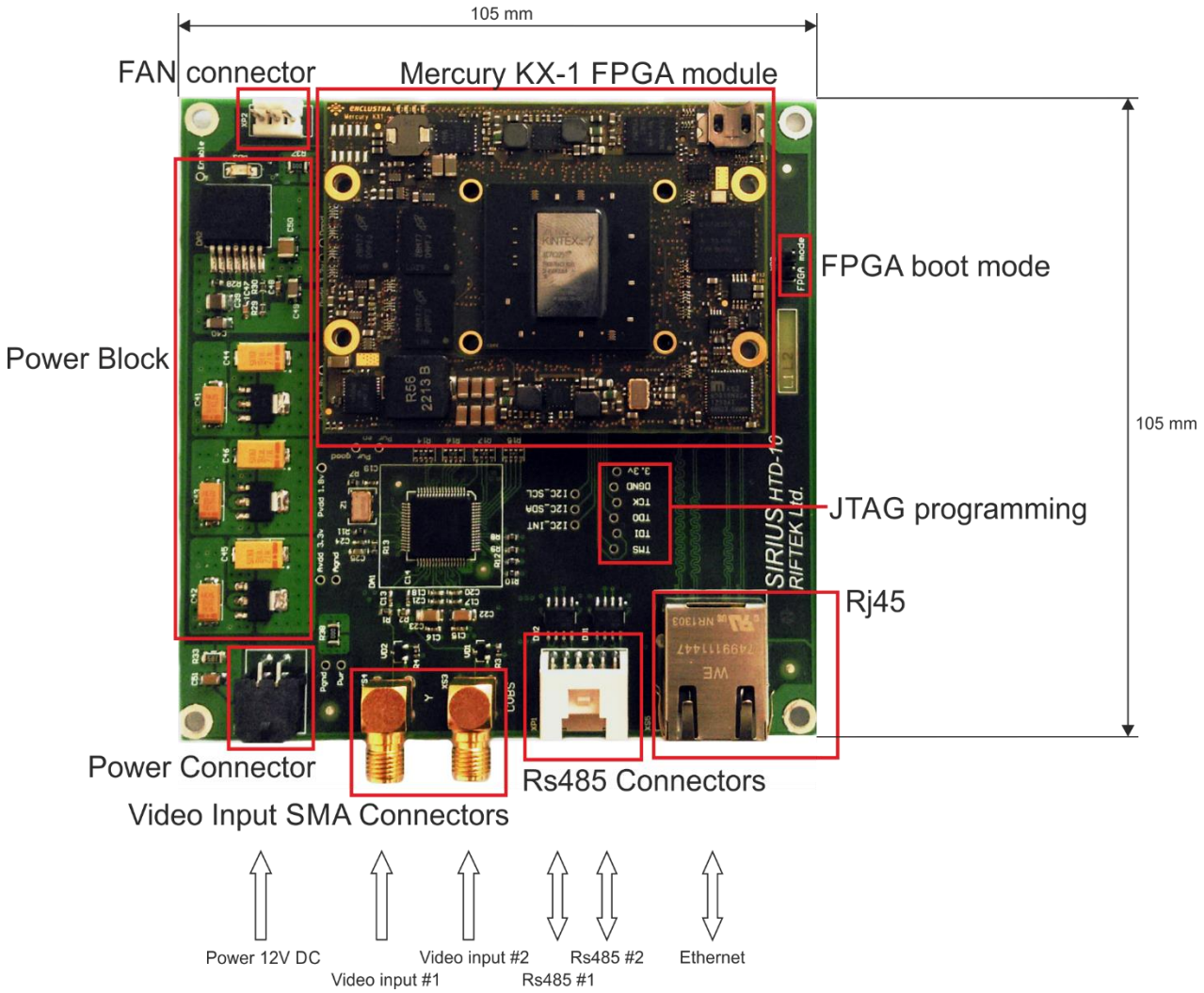

Figure 1 – General view and interfaces of HTD-10

HTD-10 has the following interfaces:

1. Video Input #1;
2. Video Input #1;
3. Rs485 #1;
4. Rs485 #2;
5. Ethernet;
6. Power 12V DC.

CONNECTOR DESCRIPTION

RS485

The Rs485 interface is intended to control the device and to exchange data with peripheral equipment. The assignment of pins for the RS485(#1,2) interfaces is shown in Figure 2.

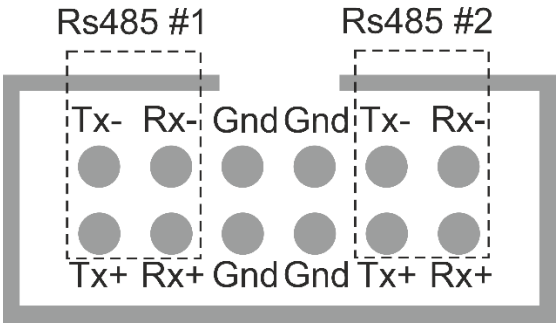

Figure 2 – The assignment of pins for RS485(#1,2) (XP1)

POWER

The assignment of the power connector (12 VDC) pins is shown in Figure 3.

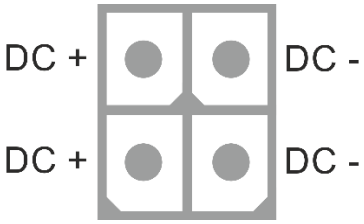

Figure 3 – The assignment of the power connector pins (XS6)

VIDEO INPUTS

Standard SMA connectors are used for video inputs.

ETHERNET

Standard connector Rj45 is used for Ethernet 1000base-T.

ELECTRONIC BOARD CONTROL POINTS

Destination of the electronic board control points is given in Table 1.

Table 1 – Destination of the electronic board control points.

Point Name	Description
Pgnd	Ground of Power Input
Pwr	Power DC 12V
Pwr good	Valid Power Signal
Pwr En	Power Enabled Signal
Dvdd	Digital Power
Avdd	Analog Power
Enable	Enable signal for power block
Dgnd	Digital Ground
Agnd	Analog Ground
Vcc io	IO Power
Vcc cfg	Configuration Power

POWER CONSUMPTION AND COOLING

HTD-10 consumes less than 10W. HTD-10 requires active cooling.

CHARACTERISTICS AND LOGIC OF FUNCTIONING

MAIN CHARACTERISTICS

Main characteristics of HTD-10 are shown in Table 2.

Table 2 – Main characteristics of HTD-10.

Parameter	Description
Maximum and minimum sizes of tracking strobes	The maximum size of the tracking strobe is 128x128 pixels. The minimum size of the tracking strobe is 16x16 pixels. The strobe size can be set separately for each channel, and can be changed during the tracking.
Number of tracking channels	5 independent tracking channels.
Maximum size of tracking objects	Maximum size of the tracking object is limited by maximum size of the tracking strobe (128x128 pixels).
Minimum size of tracking objects	HTD-10 ensures stable tracking of objects, which size is greater than 8x8 pixels.
Maximum movement speed of the object in the images of the video stream	For a sudden change of the position of the tracking object, the speed is not greater than 24 pixels per frame in any direction.
Minimum contrast of tracking objects	HTD-10 ensures stable tracking of objects with contrast from 10%.
Elongation of tracking objects	Tracking objects can have any configuration within the maximum size of tracking strobes.
Output coordinates accuracy	Output coordinates of tracking objects are obtained with 1 pixel accuracy.
Time lag of output coordinates	At the frame refresh rate of 25 Hz and maximum sizes of the tracking strobe, HTD-10 calculates the object coordinates in one tracking channel before the start of the next video frame.
Maximum frame rate	Up to 30 Hz.

HTD-10 INTERFACES

HTD-10 has the following interfaces:

1. Analog video input №1. Is used to connect cameras of the PAL standard;
2. Analog video input №2. Is used to connect cameras of the PAL standard;
3. Digital interface RS485 №1. Is used to transmit control commands to the device, and to receive information of the tracking object;
4. Digital interface RS485 №2. Is used to connect peripheral equipment, and to transit control of it (via HTD-10);
5. Ethernet interface for transferring video stream to the consumer.

OPERATION MODES

HTD-10 can work in various modes for each of 5 tracking channels.
HTD-10 has the following operation modes of the tracking channels:

1. Manual operation (hereinafter – MO);
2. Automatic tracking (hereinafter – AT);
3. Inertial tracking (hereinafter – IT).

HTD-10 has additional modes (states):

1. Overlay of graphical information or absence of overlay;
2. Activation of the first or second video input.

AUTOMATIC TRACKING MODE

Automatic tracking is the working mode of HTD-10 where the position of tracking objects is calculated in each frame of the video stream, and the position information and motion parameters of the tracking objects are calculated and transferred to the consumer.

In order to switch from the MO mode to the AT mode, the operator must start the object tracking manually by directing the tracking strobe on the object and giving the command “Capture”. Switching from the IT mode to the AT mode is performed when the tracking object is detected.

WORKING LOGIC OF THE CHANNEL IN THE AT MODE

To switch the channel into AT mode, the operator must give the «Capture» command. By this command HTD-10 generates a reference image of the object in accordance with the size and position of the capturing (tracking) strobe, a search for the tracking object in the next video frames will be performed according to the reference image. Formation of the reference image is carried out according to the current frame of video at the moment of getting the «Capture» command. When getting the next video frame, HTD-10 searches the most probable position of the tracking object in the frame relative to the previous position, and in the set maximum possible movement of the object per frame. The position of the tracking object is calculated for each frame. Calculation of horizontal and vertical speed components (in video frames) is based on the position of the tracking object in several frames. For each video frame being processed tracking failure (loss of the object from view) is calculated. When the tracking failure is detected, HTD-10 enters IT mode.

If needed (when the object dimensions or perspective changes) the operator can change the tracking strobe dimensions in AT mode without reset the tracking and recapture. The operator has the possibility to correct the tracking strobe position without interruption of tracking. The function is required to adjust the algorithm and provide qualitative tracking, when perspective changes or in high interference signaling environment.

Switching from AT mode to IT mode can be done automatically as well as manually by command. Switching from AT mode to MO mode can be done by command or automatically when the strobe reaches extreme positions in the frame.

INERTIAL TRACKING MODE

IT mode assumes the movement of the tracking strobe based on its movement parameters calculated before switching to IT mode. Thus HTD-10 searches for the object in each frame of the video stream to automatically switch back to AT mode except the case of switching to IT mode by command.

Switching to the IT mode can be done only from the AT mode when tracking failure is detected or by the command from the operator.

WORKING LOGIC OF THE CHANNEL IN THE IT MODE

Switching to IT mode can be done only from AT mode when tracking failure is detected or by the command from the operator. After the IT mode was entered automatically, HTD-10 searches for the tracking object in each subsequent video frame. When the object is detected (detection criterion is exceeded), HTD-10 recapture the tracking object. If the object was not detected during 255 frames, it is automatically removed from tracking (the channel enters MO mode). The object is removed from tracking when the tracking strobe reaches extreme positions in the frame. In case of switching to IT mode by the command, searching and capturing of the object can be done only by the command to leave IT mode. If switching to IT mode happened automatically, switching to AT mode by the command is not possible. In this case switching to AT mode either happens automatically or the object is removed from tracking.

MANUAL OPERATION MODE

MO is the mode where the operator controls the parameters and working modes of HTD-10 and automatic tracking is off.

Switching to MO mode can be done automatically from IT mode or by the command from any mode.

WORKING LOGIC OF THE CHANNEL IN THE MO MODE

In MO mode the operator controls the position and dimensions of the tracking strobes of each of the channels by giving commands via Rs485 interface. To start tracking an object by any channel, the «Capture» command should be given to HTD-10. To switch HTD-10 channel to MO mode from any other mode a command to remove the object from tracking should be given.

CONTROL OF HTD-10 ADDITIONAL MODES

Switching of input channels is done by the command from the operator. Switching between the modes mentioned above can be done regardless of the tracking channel working modes.

DATA EXCHANGE PROTOCOL

STRUCTURE OF THE DATA EXCHANGE PROTOCOL

Data exchange protocol (hereinafter - Protocol) includes the commands to HTD-10 given by the operator (user's technical system) and the data coming from HTD-10. Information exchange with HTD-10 is carried out via RS485 interface. Video data from HTD-10 is transmitted via Ethernet interface. Protocol provides the following information from HTD-10:

1. Video data;
2. Tracking channel state data;
3. HTD-10 state data;
4. Transit data from peripheral equipment.

The Protocol provides the following commands for HTD-10:

1. Tracking channel control commands;
2. HTD-10 mode control commands;
3. Commands to transfer data to peripheral equipment.

INTERFACES AND THEIR PARAMETERS

HTD-10 uses the following interfaces for data exchange:

1. Ethernet 1000base-T (to transmit video from HTD-10 only);
2. RS485 №1 to exchange data with the operator;
3. RS485 №2 to connect peripheral equipment.

Ethernet interface is used only for transferring video data from the active video input with the overlaid graphic information to the operator. The data is transferred via UDP transport protocol. The data is transmitted to the port 50000.

Interface RS485 №1 is used to exchange data with the operator. Data exchange is carried out at speed of 115200 Bod.

Interface RS485 №2 is used to connect peripheral equipment. Rippling through (transit through the HTD-10) is used to give commands to the peripheral equipment and to transfer data from the peripheral equipment to the operator. Data exchange is carried out at speed of 115200 Bod.

Commands and information messages are described below.

VIDEO DATA

Video data from HTD-10 via Ethernet interface comes immediately after switching on and connecting the matched equipment. The data comes via UDP protocol at the frequency of 25 frames per second. The video stream contains frames with the resolution of 720x576 pixels. Video data is divided into packets, each containing one line of the image (720 pixels) in the mono_8 format (1 byte per pixel gray scale). The frames come with the overlaid graphic information. Table 3 shows the structure of a video packet.

Table 3 – Structure of a video packet.

Byte №	Designation	Default value	Description
0	0x04	0x04	Constant title of video data.
1	Channel	0x00	Source number. Accepts value 0x00 if the data comes from the first source and value 0x01 - from the second.
2	FrameNum	0x00	Cyclic frame number. A new number is transferred for every new video frame. The frame number is from 0x00 to 0xFF (255) and then the counting begins again. The value of the frame number changes when all the lines of the current video image are transferred. The frame number is used by the client software for tracking the change of video frame.
3	FrameWidth	0x02	High byte of the width of the transferred image in pixels. For analog video the width is constant and equals to 720 pixels.
4	FrameWidth	0xD0	Low byte of the width of the transferred image in pixels.
5	FrameHeight	0x02	High byte of the height of the transferred image. For analog video the height is constant and equals to 576 pixels.
6	FrameHeight	0x40	Low byte of the height of the transferred image in pixels.
7	LineNum	0x00	High byte of the image line number transferred in a packet. The line number is in the range of 0x0000 (0) to 0x023F (575) = FrameHeight - 1. Line numbering starts from 0, which corresponds to the top row of the image (in the window coordinate system).
8	LineNum	0x00	Low byte of the image line number transferred in a packet.
9	Reserved	0x00	Reserved.
10	Reserved	0x00	Reserved.
11	Reserved	0x00	Reserved.
12	LineData[0]	0x00	The first byte of the video data. In every packet the image line is transmitted completely (720 bytes for analog video, which corresponds to FrameWidth). Data bytes of the line follow one another. Image Format - 1 byte per pixel (grayscale, mono_8).
13	LineData[1]	0x00	The second byte of the video data.
…	…	…	…
Frame Width+ 11	LineData[Fram eWidth - 1]	0x00	The last byte of the video data (the value of the rightmost pixel in the transferred row). The numbering is given for the resolution of 720 * 576 pixels.
Frame Width+ 12	CRC	0xFF	Checksum - high byte. The checksum is considered to be the sum of all bytes of the packet (including the title 0x04) up to the CRC checksum.

Byte №	Designation	Default value	Description
Frame Width+ 13	CRC	0xFF	Checksum.
Frame Width+ 14	CRC	0xFF	Checksum.
Frame Width+ 15	CRC	0xFF	Checksum - low byte.

Note: to receive video information, you need to specify the IP address of the PC host as the value of 10.41.1.194.

TRACKING CHANNEL STATE DATA

Tracking channel state data is transmitted via the Interface RS485 to the operator in one packet containing the data of 5 tracking channels. The data is transferred for every video frame (1 packet per 1 frame). Table 4 shows the structure of the packet of the tracking channel state data.

Table 4 – Structure of the packet of the tracking channel state data.

Byte №	Designation	Default value	Description
0	0x06	0x06	Constant title of the packet.
1	StatusFlag	0x00	Channel state flag: 0x01 – the channel is busy (AT mode is on), 0x00 – the channel is free (AT mode is off).
2	ProlongationFlag	0x00	Extended path mode flag 0x00 – path extension is off, 0x01 – path extension is on. Extended path flag is actual in IT mode only. If the channel is free extension flag should be set to 0x00.
3	ProlongationReverseCount	0x00	The countdown from the start of trajectory extension. At the initial moment value is set to 0xFF when the value 0x00 is reached the tracking is forced to reset.
4	X	0x00	High byte of the horizontal coordinate of the tracking strobe center.
5	X	0x00	Low byte of the horizontal coordinate of the tracking strobe center.
6	Y	0x00	High byte of the vertical coordinate of the tracking strobe center.
7	Y	0x00	Low byte of the vertical coordinate of the tracking strobe center.
8	StrobW	0x00	Width of the tracking strobe of the given channel.
9	StrobH	0x00	Height of the tracking strobe of the given channel.
10	VelX	0x00	High byte of horizontal smooth component of the tracking strobe displacement speed in AT mode.
11	VelX	0x00	Low byte of horizontal smooth component of the tracking strobe displacement speed in AT mode. To get the displacement speed in «pixel/frame» grade divide the obtained value by 256.

Byte №	Designation	Default value	Description
12	VelY	0x00	High byte of vertical smooth component of the tracking strobe displacement speed in AT mode. To get the displacement speed in «pixel/frame» grade divide the obtained value by 256.
13	VelY	0x00	Low byte of vertical smooth component of the tracking strobe displacement speed in AT mode.
14	TargetSubStrobX	0x00	Horizontal coordinate of the upper left corner of the target strobe within the tracking strobe. Coordinate system begins in the left upper corner of the tracking strobe. IMPORTANT! For the current version of the protocol, the value is always equal to 0x00.
15	TargetSubStrobY	0x00	Vertical coordinate of the upper left corner of the target strobe within the tracking strobe. Coordinate system begins in the left upper corner of the tracking strobe. IMPORTANT! For the current version of the protocol, the value is always equal to 0x00.
16	TargetStrobW	0x00	Width of the target strobe within the tracking strobe. The parameter is used to separate the object from the background within the tracking strobe for the further maintenance or other adjustments. IMPORTANT! For the current version of the protocol, the value is always equal to 0x00.
17	TargetStrobH	0x00	Height of the target strobe within the tracking strobe. The parameter is used to separate the object from the background within the tracking strobe for the further maintenance or other adjustments. IMPORTANT! For the current version of the protocol, the value is always equal to 0x00.
…	…	…	… (Repeating of another 4 blocks of 17 bytes for the next 4 tracking channels)
86	CRC	0xFF	Checksum - high byte. The checksum is considered to be the sum of all bytes of the packet (including the title 0x06) up to the CRC.
87	CRC	0xFF	Checksum.
88	CRC	0xFF	Checksum.
89	CRC	0xFF	Checksum - low byte.

HTD-10 STATE DATA

HTD-10 state data is transferred via RS485 interface. The data is transferred for every video frame (1 packet per 1 frame). Table 5 shows the structure of the packet of the HTD-10 state data.

Table 5 – Structure of the packet of the HTD-10 state data.

Byte №	Designation	Default value	Description
0	0x09	0x09	Constant title of the packet.
1	Reserved	0x00	Reserved
2	channelNum	0x00	Active video input number: 0x00 – first channel, 0x01 – second channel.
3	Reserved	0x00	Reserved

Byte №	Designation	Default value	Description
4	Reserved	0x00	Reserved
5	Reserved	0x00	Reserved
6	Reserved	0x00	Reserved
7	Reserved	0x00	Reserved
8	Reserved	0x00	Reserved
9	CRC	0xFF	Checksum - high byte. The checksum is considered to be the sum of all bytes of the packet (including the title 0x06) up to the CRC.
10	CRC	0xFF	Checksum.
11	CRC	0xFF	Checksum.
12	CRC	0xFF	Checksum - low byte.

TRANSIT DATA FROM PERIPHERAL EQUIPMENT

Data from the peripheral equipment enters the HTD-10 via interface RS485 №2. Having received the data HTD-10 «frames» it in accordance with the protocol and transmits via RS485 to the operator. Table 6 shows the structure of the data packet containing data from peripheral equipment.

Table 6 – Structure of the data packet containing data from peripheral equipment.

Byte №	Designation	Default value	Description
0	0x08	0x08	Constant title of the packet.
1	PortNum	0x03	The number of the port that sent the data. The number of the data channel connected to any physical device. Data channels are numbered in the following order: 0 - Ethernet#1, 1 – Ethernet#2, 2 – RS485#1, 3 – RS485#2, 4 – RS485#3, 5 – RS485#4, 6 – RS485#5. IMPORTANT: In the current version of the protocol, constant value of 0x03 should be set.
2	BytesCount	0x00	High byte of the transmitted data amount.
3	BytesCount	0x01	Low byte of the transmitted data amount. IMPORTANT: The amount of transmitted data should exceed or be equal to 1.
4	Data[0]	0x00	The first byte of the data transmitted from peripheral device.
5	Data[1]	0x00	The second byte of the data transmitted from peripheral device.
…	…	…	…
BytesCount + 3	Data[BytesCount - 1]	0x00	The last byte of the data transmitted from peripheral device.
BytesCount + 4	CRC	0xFF	Checksum - high byte. The checksum is considered to be the sum of all bytes of the packet (including the title 0x04) up to the CRC.
BytesCount +	CRC	0xFF	Checksum.

Byte №	Designation	Default value	Description
5			
BytesCount + 6	CRC	0xFF	Checksum.
BytesCount + 7	CRC	0xFF	Checksum - low byte.

TRACKING CHANNEL CONTROL COMMANDS

Tracking channel control commands are transmitted for each channel separately and allows to control the automatic tracking process. Table 7 shows the structure of tracking channel control command.

Table 7 – Structure of tracking channel control command.

Byte №	Designation	Default value	Description
0	0x07	0x07	Constant title of the packet.
1	CnannelNum	0x00	Tracking channel number from 0x00 to 0x04 (5 tracking channels in total). Parameters of the tracking channel to be modified should be specified in the field.
2	Command	0x00	Code of the command (action code) for the tracking channel. The following commands are valid: 0x00 – adjust the position of the tracking strobe (is processed in MO mode only), 0x01 – capture for tracking, 0x02 – remove from tracking, 0x03 – switch to extension path mode, 0x04 – switch off extension path mode (automatic recapture, if the object is find in the search strobe), 0x05 – adjust the tracking strobe position (the position of the strobe is adjusted in AT mode in increments of 2 2 pixels in a specified side), 0x06 – adjust the tracking strobe size.
3	X	0x00	High byte of the horizontal coordinate of the tracking strobe center.
4	X	0x00	Low byte of the horizontal coordinate of the tracking strobe center.
5	Y	0x00	High byte of the vertical coordinate of the tracking strobe center.
6	Y	0x00	Low byte of the vertical coordinate of the tracking strobe center.
7	W	0x10	Width of the tracking strobe of the given channel.
8	H	0x10	Height of the tracking strobe of the given channel.
9	DeltaX	0x00	Horizontal offset to adjust the tracking strobe position in AT mode. Values can be either positive or negative (1 in the high bit indicates a negative value). Offset is allowed no more than 4 pixels for one command. Increment allowed – 0x02.
10	DeltaY	0x00	Vertical offset to adjust the tracking strobe position in AT mode.

Byte №	Designation	Default value	Description
11	Reserve	0x00	Reserved.
12	CRC	0xFF	Checksum - high byte. The checksum is considered to be the sum of all bytes of the packet (including the title 0x06) up to the CRC.
13	CRC	0xFF	Checksum.
14	CRC	0xFF	Checksum.
15	CRC	0xFF	Checksum - low byte.

Note: the following sizes of data strobe are permitted according to the number of channel used:
1 channel – 128x128 pixels;
2 channels – 80x80 pixels each channel;
3 channels – 64x64 pixels each channel;
4 channels – 40x40 pixels each channel;
5 channels – 40x40 pixels each channel.

HTD-10 MODE CONTROL COMMANDS

HTD-10 mode control commands are used to choose the video source and enable/disable graphic data overlay. Table 8 shows the structure of HTD-10 mode control command.

Table 8 – Structure of HTD-10 mode control command.

Byte №	Designation	Default value	Description
0	0x0A	0x0A	Constant title of the packet.
1	Reserved	0x00	Reserved
2	channelNum	0x00	Active video input number: 0x00 – first channel, 0x01 – second channel.
3	Reserved	0x00	Reserved.
4	Reserved	0x00	Reserved.
5	Reserved	0x00	Reserved.
6	Reserved	0x00	Reserved.
7	Reserved	0x00	Reserved.
8	CRC	0xFF	Checksum - high byte. The checksum is considered to be the sum of all bytes of the packet (including the title) up to the CRC.
9	CRC	0xFF	Checksum.
10	CRC	0xFF	Checksum.
11	CRC	0xFF	Checksum - low byte.

COMMANDS TO TRANSFER RANDOM DATA TO PERIPHERAL EQUIPMENT

Commands to transfer random data to peripheral equipment are intended to control peripheral equipment. Table 9 shows the structure of the data transfer command to the peripheral equipment.

Table 9 – Structure of data transfer command to peripheral equipment.

Byte №	Designation	Default value	Description
0	0x05	0x05	Constant title of the packet.
1	PortNum	0x03	Number of the port to receive the data. The number of the data channel connected to any physical device. Data channels are numbered in the following order: 0 - Ethernet#1, 1 – Ethernet#2, 2 – RS485#1, 3 – RS485#2, 4 – RS485#3, 5 – RS485#4, 6 – RS485#5. IMPORTANT: In the current version of the protocol, constant value of 0x03 should be set.
2	BytesCount	0x00	High byte of the transmitted data amount.
3	BytesCount	0x01	Low byte of the transmitted data amount. IMPORTANT: The amount of transmitted data should exceed or be equal to 1.
4	Data[0]	0x00	The first byte of the data transmitted from peripheral device.
5	Data[1]	0x00	The second byte of the data transmitted from peripheral device.
…	…	…	…
BytesCount + 3	Data[BytesCount - 1]	0x00	The last byte of the data transmitted from peripheral device.
BytesCount + 4	CRC	0xFF	Checksum - high byte. The checksum is considered to be the sum of all bytes of the packet (including the title 0x04) up to the CRC.
BytesCount + 5	CRC	0xFF	Checksum.
BytesCount + 6	CRC	0xFF	Checksum.

RECOMMENDED PRINCIPLES TO ORGANIZE DATA EXCHANGE WITH HTD-10

The data exchange protocol allows to organize the confirmation of execution of the commands given to HTD-10. Since there is always a chance of losing commands and data packets in the user's software, it is needed to provide the execution control. Considering periodic sending of tracking channel state data and HTD-10 mode data (25 packet per second), short-term loss of data is not a serious problem for the functioning of the techniques connected to the HTD-10. The loss of commands has the critical value, as the commands are usually short-term (single). It is recommended to avoid the modes in local variables without confirmation from the HTD-10 within the user's software. HTD-10 state information should be renewed in the user's software according to received information only. This way it is possible to control the execution of commands.