Mini Computer System Solution Manual

Club and Associations Systems

Web Cam Server

Remote Display

Kiosk Display

Bare Metal Systems

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1 Introduction

1.1 The Features

The mini computer system solution can be enabled for the following features :-

1) club and association systems :-
    i) membership management.
    ii) blogging and commenting.
    iii) event notification and booking.
    iv) bulk emailing.
2) remote streaming web cam.
3) remote display \ kiosk display.

1.2 Club and Association Systems

1.2.1 Membership Management

Maintaining membership lists and details :-

- uploading and downloading the membership list in a .CSV format.
- adding in, editing and removing individual membership details.
- linking of membership details to the other features.

1.2.2 Blogging and Commenting

Full blogging and commenting facilities. WordPress based.

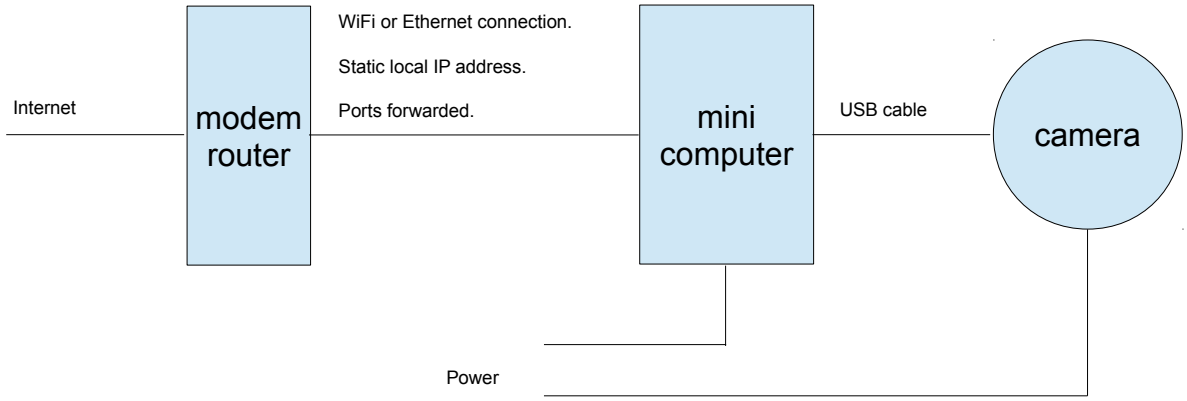
1.2.3 Event Notification and Booking

Creation of upcoming events. Notification of the details to the members.

1.2.4 Bulk Emailing

Able to create and send bulk emails.

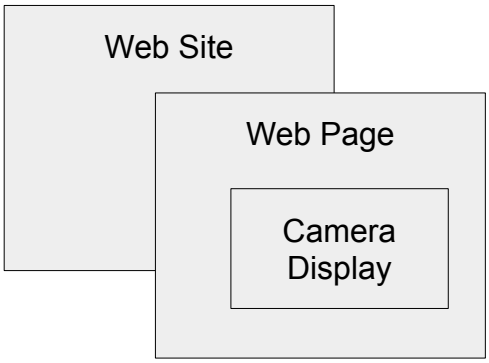
1.3 Camera Site



The camera is connected to a mini computer that is connected via the modem router to the Internet. This supplies the video feed to the web site.

1.4 Web Site

The camera web site takes the video feed and displays it via a web page.



The web site is constructed as per any standard normal web site. Single or multiple cameras can be displayed. Extra features can be added - please contact us to arrange for them.

Please Note :- if the mini computer is connected to a domestic Local Area Network running on a Dynamic Domain Name Service the Internet Protocol Address will change regularly. If the feed doesn't display (due to your browser cache contents needing refreshing) just press Ctrl R - Reload Frame. On some browsers you might need to delete your recent history. This is not an issue on local networks with a static IP address.

The remote display \ kiosk display has its own separate web site.

2 The Mini Computer

The basic mini computer system consists of :-

Raspberry Pi 3 Model B 1GB minicomputer
Raspberry Pi 3 case
Raspberry Pi 3 power supply - T6091DV PSU, RASPBERRY PI, 5V, 2.5A, AUS or similar
SanDisk Ultra microSDHC 16GB card or similar. - this contains an image of the system code.

This provides all the features for the clubs and associations solution except camera capability.

3 The Cameras

The web cams are supplied in 2 different camera versions :-

1) indoor.
2) outdoor.

3.1 Indoor

The indoor camera system consists of :-

Raspberry Pi 3 Model B 1GB minicomputer
Raspberry Pi 3 case
Raspberry Pi 3 power supply - T6091DV PSU, RASPBERRY PI, 5V, 2.5A, AUS or similar
SanDisk Ultra microSDHC 16GB card or similar. - this contains an image of the system code.
Logitech c270 camera or similar
optional USB extension cable - Belkin 3M or similar

3.2 Outdoor

The outdoor camera system consists of :-

Raspberry Pi 3 Model B 1GB minicomputer
Raspberry Pi 3 case
Raspberry Pi 3 power supply - T6091DV PSU, RASPBERRY PI, 5V, 2.5A, AUS or similar
SanDisk Ultra microSDHC 16GB card or similar. - this contains an image of the system code.
Elp (Ailipu) HD1080P 1.0 Megapixel USB IP67 outdoor camera with night vision or similar
Targus 4-Port USB Powered Hub with 4A AC adapter or similar
Short USB plug to USB plug cable - supplied with the hub
Plastic case - low cost lunch box style from the supermarket

Please Note - it is very important that :-

1) the mini computer and power supplies be in an area where the air is freely circulating and be located in the shade. This ensures that the minicomputer does not over heat.
2) that the mini computer and hub and power supplies be kept dry.

The plastic case is provided to help ensure that mini computer and hub are kept cool and dry.

3.3 System Solution Provision

We provide the system solution on the microSD card. This requires that we program the card with the required system image. All other components are off the shelf components. The only important thing is that they connect together and perform to the requirements. We can supply the microSD card separately and in bulk. We can also supply you with a master microSD card that you can duplicate from. And we can supply you with prices for the installations along with full remote technical support and web site design. We handle the back end of the system including the product licensing. The usage license is a fixed one off license. Quantity discounts are applied.

3.3.1 Duplication

3.3.1.1 Storing the Image

i. on a Windows PC use the Win32DiskImager program from - https://sourceforge.net/projects/win32diskimager/ .
ii. put the master microSD card into an adapter (microSD to SD and SD to USB) and plug it into a USB socket on the PC.
iii. do not format the microSD card.
iv. using Win32DiskImager make a local copy of the microSD card image. Use this for backup and for production purposes.

3.3.1.2 Writing the Image to the microSD Card

i. on a Windows PC use the Etcher program (balenaEtcher) from - https://www.balena.io/etcher/ .
ii. put the new microSD card into an adapter (microSD to SD and SD to USB) and plug it into a USB socket on the PC.
iii. do not format the microSD card.
iv. using Etcher write the image to the microSD card.

3.3.2 Mass Production

The microSD card can be mass produced by using equipment such as a SySTOR memory card duplicator -

http://esystor.com/page/category/MEMORY_CARD_DUPLICATORS.html .

4 Setting Up

4.1 Notes

1) in this document B827EB05F5FA corresponds to the MAC address of the minicomputer. It is printed on a label that is placed underneath the minicomputer. The specific MAC address B827EB05F5FA actually corresponds to the minicomputer used for our roocam demonstration camera. In this document it is used as an example MAC address.
2) in this document 8100 corresponds to the base port (of the 20 ports) being used for the minicomputer. In this document it is used as an example base port.

4.2 Accessing

When the minicomputer is first booted up it will be in its default state and it will enable an access point with the SSID HotSpot_B827EB05F5FA.

i. log on to the hotspot - use password wombat6285 .
ii. navigate to 10.42.0.1.

4.3 Configuration

The configuration pages are located at 10.42.0.1/config. Full instructions are contained there within. The log on user name is: admin , and the default password is: wombat6285 .

In order to display the local access points (ie. where the access points are not prior known) insert a 2nd. WiFi USB stick into the mini computer. The access points will be listed on the drop down list on the WiFi page.

When the configuration has been saved press the Install & Reboot button.

The Default & Reboot and Release Image buttons will set the system back to its default settings.

If you are preparing the card as a master card for duplication press the Power Off button before unplugging the power supply and removing the card.

4.4 Installation

Installation requires :-

1) the physical installation of the equipment.
2) 2 mains power sockets for the outdoor camera or 1 mains power sockets for the indoor camera.
3) via the Local Area Network router setting up :-
   i. static IP address assignment to the minicomputer. This binds the chosen IP address to the MAC address of the minicomputer. When the minicomputer boots up it will be assigned the IP address by the DHCP server on the router.
   ii. port forwarding to the minicomputer. A block of 10 ports in the range of 8100 upwards are assigned. When the router receives communications on any of these ports it will forward them to the minicomputer.

   Knowledge of the router's admin log on user name and password is required.
4) configuring the minicomputer parameters - general, wifi, web cam, password. Knowledge of the router's WiFi log on user name and password is required.
5) installing the configuration and rebooting the minicomputer.
6) if you require your local network to be switched to a static IP address and if you are using a NBN modem select the static IP address option via the modem's control panel. Otherwise you will need to arrange with your ISP.
7) constructing the web page for the web cam on your main web site. This requires the FTP log on details. This would usually be handled by your web site development service and we can provide full support.
   You can also upload the web site pages via the web site builder on the configuration pages. And you can use the web site constructor to construct the web site pages.
8) downloading the site manager and installing it on your web site or using the site manger on our web site located at http://baremetal.systems/sites/reg/ .
9) linking via the site manager from your web page to the mini computer web server and the web cam.

<u>Notes</u>

i. the size of the camera frame (w x h) and the fps effect the bandwidth.
ii. typically set the indoor camera to 640w x 360h or 640w x 480h.
iii. typically set the outdoor camera to 640w x 480h.
iv. typically set the frames per second to 2fps for low network bandwidth (upload bandwidth) and 8fps for high network bandwidth.
v. the size of the frame determines what amount of text is displayed at the bottom. Typically, for the HTML iframe parameters, add 40 pixels to the width and 20 to 40 pixels to the height. Set the margins to half these values.
vi. when you save the settings your browser will display the new values.
vii. browsers and the Internet infrastructure cache web pages. If your browser is displaying an old page press Ctrl R to refresh the page. If that does not get the new page then delete the recent browser history and refresh the page.

4.5 Internal LAN URLs for Configuration via the Hot Spot

web page	http://10.42.0.1
web cam direct	http://10.42.0.1/php/webcam.php
configuration	http://10.42.0.1/config

4.6 Site Manager

The mini computer registers with a site manager. The URL for the site manager is specified on the General configuration page. The site manager provides the means to access and manage the mini computer and web cam.

The site manager files can be downloaded from our web site.

5 IP Address Assignment

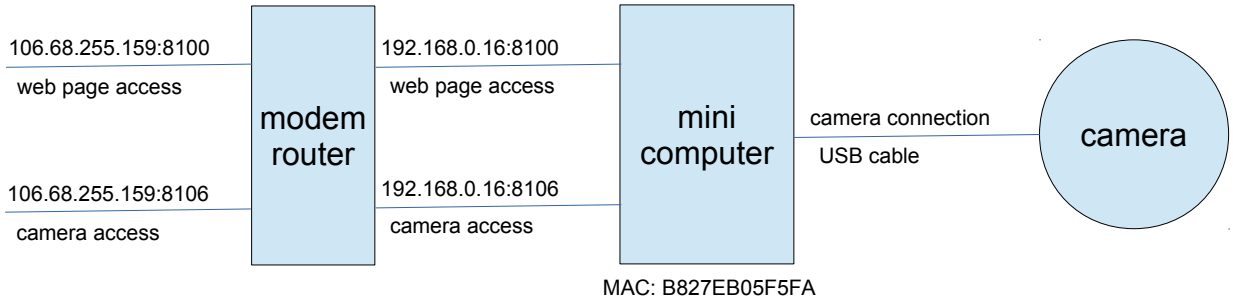
5.1 Introduction

When you are accessing a web site via its domain name - eg. baremetal.systems - this is transformed by the Domain Name Servers into a numerical Internet Protocol address - in this case - 46.30.213.67 . When you use the URL http://baremetal.systems you are telling your browser to use the Hyper Text Transport Protocol service. All services have a server program sitting on their servers listening on a port. Widely used public services have a fixed default port number assigned to them. HTTP uses the default port 80. So if you used, for example, 46.30.213.67:80 you would, theoretically, have exactly the same access. It's not as simple as that for hosted services and for services using Content Network Distribution services, such as Akamai. However for Local Area Network based access it is. This is the technique that is used to access our minicomputers.

LANs use modem routers to connect to the external Internet network. The router assigns the units (devices) on the local network their IP addresses. These can be dynamic or be static (fixed). In order to set up port forwarding static local IP addresses must be used. Typically these are in the range of 192.168.0.2 ... 192.168.0.254 .

The routers can be set up to assign a static local IP address to specific units (devices) on the network. To do this they are configured via an IP address table to always assign a fixed access to the specific MAC address of the unit. MAC addresses are unique so this is simple to set up. The router can be configured to direct traffic on specific ports to specific units. On some routers it's just a matter of specifying the port number or port range to forward traffic to the unit on. On other routers it's a matter of creating a specific service name and associated port number or port range for that service and then enabling the service for the unit. Either way the router will direct all traffic on the port or port range that it receives from external to the network (modem side) through to the unit on the local side.

The servers on the minicomputers listen on their own specific assigned ports within a 10 port range. This allows connection to the HTML web pages, to the camera and to the support services such as the FTP access. Each of these are offset from the ports base.



5.2 Determining the LAN IP Address Range

Your computer's IP address can be determined on your computer by using :-

Windows

1. open a Command Window
2. type in ipconfig
3. press Enter

Linux

1. open a Terminal Window
2. type in ifconfig
3. press Enter

This will show you the computer's IP address and consequently the range of IP addresses on the LAN.

5.3 IP Address Assignment

External IP addresses are assigned either as static addresses (fixed) or dynamic addresses (assigned out of a pool with a limited lease time (eg. 11 hours)). Commercial LANs are normally assigned static addresses. Domestic LANs are normally assigned dynamic addresses. It is possible, by arrangement with your ISP, to get static address assignment set up - it is a simple exercise. NBN modems have static IP address assignment as an option.

Dynamic addresses need to be regularly registered with a DDNS service. We have a simple such service set up on the Bare Metal Systems server and can provide a direct linking service via our server to the cameras. When the LAN address is reassigned the minicomputer will register the new IP address on the LAN within 10 minutes.

Static addresses provide a means of directly linking to the minicomputers - ie bypassing any DDNS. Because they are not changing they are 100% reliable.

A static IP address will typically look like :-

web page	http://220.253.171.120 http://220.253.171.120:8100
web cam direct	http://220.253.171.120/php/webcam.php http://220.253.171.120:8106
configuration	http://220.253.171.120/config
daily logs	http://220.253.171.120/log

Your local IP address can be checked via https://whatismyipaddress.com/ .

Your ports (port forwarding) can be checked via http://www.canyouseeme.org/

and via https://www.yougetsignal.com/tools/open-ports/ .

This is accessible via our site manager located at http://baremetal.systems/sites/reg/ . You can put a copy of the site manager on your web site and link directly to it.

5.4 Port Assignments

Port Offset	Port Assignment	Notes
00	HTTP \ HTML	web page - website
03	FTP	usr: website - pwd: wombat6285
06+n	HTTP \ HTML	webcam n (0-3) direct feed

6 Router Configuration

6.1 Static IP Address Assignment

Small area LANs usually use the address range of 192.168.X.X - typically in the first block of 256 addresses - 192.168.0.X. Each block assigns up to 252 available addresses.

Static IP address assignment assigns individual addresses to individual devices by corresponding them with the device's MAC address (hardware address). This ensures that the device can always be contacted on the local network via that assigned IP address.

6.2 Port Forwarding

Port forwarding forwards data received on specific external ports to the corresponding port on specified individual devices. This allows devices connected to the modem router to be accessed directly via the modem router (ie. as if they were on the modem router itself).

6.3 Configuration Example - Netgear DG834G

1) after configuring, saving the settings and installing the settings on the mini computer and booting it up check for its presence under Attached Devices. This will show the dynamically assigned IP address and the associated MAC address of each device on the network. The MAC address of the mini computer will correspond to the MAC address on the label on the underside of the mini computer and on the side of the protective plastic box.
2) on LAN IP Setup assign a fixed static IP address to the mini computer - correspond the IP address with the MAC address of the mini computer.
3) under services create a service corresponding to the 10 ports that are going to be forwarded to the mini computer - eg. 8100-8109. Not all these ports are used but the whole block is assigned for future proofing.
4) under Firewall Rules correspond the static IP address of the mini computer with the service for the mini computer. This will direct any traffic received on the external wide area network on these ports through to the mini computer on the local area network.
5) reboot the modem router.

7 Camera Bandwidth

The usable bandwidth of the web cam is primarily determined by the available bandwidth of the local network. The bandwidth that the web cam requires is determined by the number of pixels (width x height) and by the frames per second. Doubling the width and height quadruples the required bandwidth. Doubling the fps double the required bandwidth. Long external network distances will reduce the ability to be able to use high bandwidths. The bandwidth to adjust to is best checked remotely - by experiment.

Typically 640w x 480h at 2 fps on a local (domestic) network is 100% usable world wide. 4fps is also realistic. 24 fps (movie rate) can be used within the local network area. 8fps can be used as a realistic external network compromise. Where movie style display is required dropping the resolution down to 320w x 240h greatly helps.

8 Downloads

A file download section is provided on the Bare Metal Systems website.

9 Uploading the Web Site Files

The web site files can be uploaded via the configuration pages. The root file must be index.html. FTP can also be used.

9.1 Page Construction

1) place within the header :-

```
<HEAD>
  <META HTTP-EQUIV="Cache-Control" CONTENT="no-store">
  <META HTTP-EQUIV="Cache-Control" CONTENT="private">
</HEAD>
```

these ensure that the page is always refreshed when redisplayed.

2) the iframe statement :-

<iframe src="php/webcam.php" width="680" height="500" frameborder="NO" border="0" framespacing="0" scrolling="NO"></iframe></td>

accesses and displays the web cam. Extra width and height are provided for margins. This is placed within the body of the HTML file.

Individual web cams can be accessed by using webcam.php?n=2 where n=2 indicates to use the second web cam.

3) if a php file is being used where it is echoing HTML text then where a " occurs within the HTML text it must be escaped by being preceded by a \ as in \" .

Information on HTML construction can be obtained from - https://www.w3schools.com/html/ .

9.2 FTP Transfer

The FTP access is provided for remote updating of the web page. This allows the pages to be downloaded to a sandbox area. The web site can then be loaded via the config pages by using the Website Builder / Upload page Build button.

For the webcam website the FTP user name is 'website' and the password is set to the same password as the config password (default 'wombat6285'). The FTP port is offset by 03 from the ports base. The root directory is website.

For the display website the FTP user name is 'display' and the password is set to the same password as the config password (default 'wombat6285'). The FTP port is offset by 03 from the ports base. The root directory is website.

The Filezilla program can be used for the FTP transfer - https://filezilla-project.org/ .

10 Cacheing Problems

Browsers store a local copy of all pages and files (such as images) that they download from web sites. This ensures speedy access. However it means that if the page content is is changed at the web site that the browser can be displaying old content. As such it's important to ensure that with any web page that has changing content the browser does load a fresh copy. This is usually not a problem and is handled by web site designers.

Dealing with cacheing problems :-

i. meta tags can be used to force a refreshing of the page on redisplay.

ii. where forms are being used use a combination of JavaScript and PHP. Use the PHP to construct a JavaScript variable declaration and value loading.

iii. manual refreshing - Ctrl R, reload frame, delete recent history and reload frame - these are 100% reliable but not ideal.

10.1 Meta Tags

Where used: placed within the index.html file header :-

```
<HEAD>
  <META HTTP-EQUIV="Cache-Control" CONTENT="no-store">
  <META HTTP-EQUIV="Cache-Control" CONTENT="private">
</HEAD>
```

these ensure that the page is always refreshed when redisplayed.

Where used: placed within the index.php file header :-

```
<HEAD>
  <META HTTP-EQUIV=\"Cache-Control\" CONTENT=\"no-store\">
  <META HTTP-EQUIV=\"Cache-Control\" CONTENT=\"private\">
</HEAD>
```

these ensure that the page is always refreshed when redisplayed.

10.2 Forms

If a <form> section is being used and the values are being loaded via JavaScript then place the value loading section within a PHP file. This ensures that the page refreshes correctly.

10.3 Browser Side

After you have uploaded your web site files and pressed the build button you will need to delete the recent history in your browser's cache and then reload the web cam's web site frame - Ctrl R. If you find that the contents being displayed on your browser are not what you expect them to be then you need to delete your recent browser history and then refresh the page.

11 Accessing

The minicomputer has its own web page. That can be used or the web cam can be accessed directly.

To acces the web cam either create your own site manager directory area on your website or use our default area at http://baremetal.systems/sites/reg . The site manager files can be downloaded from our web site. The system will register with the site manager every 10 minutes.

To access the system use these URLs :-

web page	http://baremetal.systems/sites/reg/unit/B827EB05F5FA/index.php
config pages	http://baremetal.systems/sites/reg/unit/B827EB05F5FA/config.php
admin pages	http://baremetal.systems/sites/reg/unit/B827EB05F5FA/admin.php
membership pages	http://baremetal.systems/sites/reg/unit/B827EB05F5FA/membership.php
blogging pages	http://baremetal.systems/sites/reg/unit/B827EB05F5FA/blog.php
events page	http://baremetal.systems/sites/reg/unit/B827EB05F5FA/events.php
web cam	http://baremetal.systems/sites/reg/unit/B827EB05F5FA/webcam.php
web cam direct	http://baremetal.systems/sites/reg/unit/B827EB05F5FA/cam.php
log pages	http://baremetal.systems/sites/reg/unit/B827EB05F5FA/log.php

Substitute the the web cam's MAC address - printed on the label - for the B827EB05F5FA part.

The default site manager can be accessed at http://baremetal.systems/sites/reg/ . Substitute this URL with the location of your site manager.

Blogging and commenting are at the same location.

12 Licensing

The usage license for the minicomputer is provided by us by email. In order to be able to generate this we require the list file to be generated and stored by your Site Manager and for you to copy and paste it into an email and to send that to us.

13 Support

We can provide telephone and online support. In order to be able to provide support where that requires online access to the minicomputer we need access to your Site Manager. If you do not want anyone else to be able to access the minicomputer just password protect the directory where you have your Site Manager.

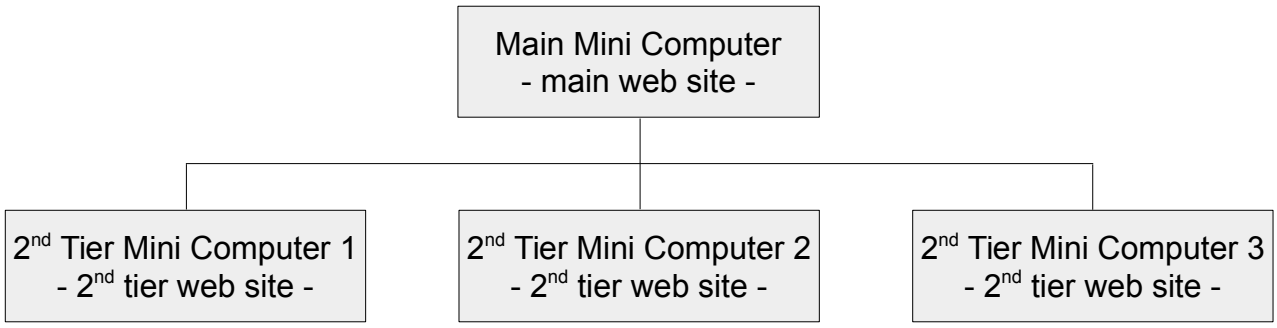
14 Label Printing

The label can be printed via the Status page.

The mini computer is set up to print on DYMO LabelWriter 450 printers using Large Address 36mm x 89mm labels.

15 Scalability

Because the mini computers operate as mini web servers they can be connected together via the LAN to form an integrated scaled system. The main web server serves pages from the next tier down web servers in an integrated manner so that they all look like they come from the main server. Likewise the web cams. This is useful where a network of multiple cameras is being constructed.



16 Add Ons

Because the system is based around a mini computer and because it is running a mini web server a range of add ons can be accommodated such as :-

1) a weather station including temperature, pressure, humidity and wind speed.
2) Passive InfraRed sensor - detection of humans and animals.
3) switch sensing - eg. an alarm sensor, a gate sensor.
4) solenoid control - eg. a door or gate latch.
5) solar and battery based power supply.

Customised code can be provided such as :-

1) photo recording.
2) picture uploading to your web site. Streaming from your web site (used for large amounts of users accessing at any one time).

17 Trouble Shooting

Generally speaking the system will be 100% reliable. There will be very few problems.

What to look for if you are unable to access the web cam :-

1) ensure that the mini computer and the router have been set up correctly. Ensure that the cables are all plugged in and that the power is on.

2) check to see whether you have a large amount of local traffic on the network - movies being watched, games being played etc. .

   The network has a down link and an up link. These are separate and as such the down link traffic (traffic from outside) won't effect up link traffic such as the web cam. However traffic on the network such as movies being served from a local movie server or large amounts of data being backed up will effect the web cam communication.

3) if your LAN is using dynamic IP address assignment for its external address your ISP DHCP server will be regularly (eg. every 11 hours) assigning your network with a new address. There will be a period between this time and the next time that the minicomputer registers with our server that the web cam will not be accessible. Wait 10 minutes and then refresh the web cam page - press Ctrl R or right click and select reload frame. If this doesn't solve the problem delete your recent history cache (last hour) and then refresh the web cam page.

   This is solved permanently by having a static IP address assigned to your local network.

4) the router on the LAN must be set up to assign a static local IP address to the minicomputer and to forward a set of ports to the minicomputer. If there is any mismatch on these - between the router and the minicomputer - the web cam will not be connected into the outside world.

5) if all else fails - reboot (switch off \ on or unplug and plug in) the router and reboot the mini computer.

17.1 Default State

If the minicomputer needs to be put into its default state and where it cannot be connected to via a browser :-

i. power off the minicomputer.
ii. remove the microSD card from the minicomputer - located at one end at the bottom.
iii. place it in an adapter and place that in the USB slot of a laptop or PC - preferably Linux OS based.
iv. navigate to the /cfg directory.
v. in that directory create a directory named default.
vi. put the microSD card back in the minicomputer.
vii. power up the minicomputer.