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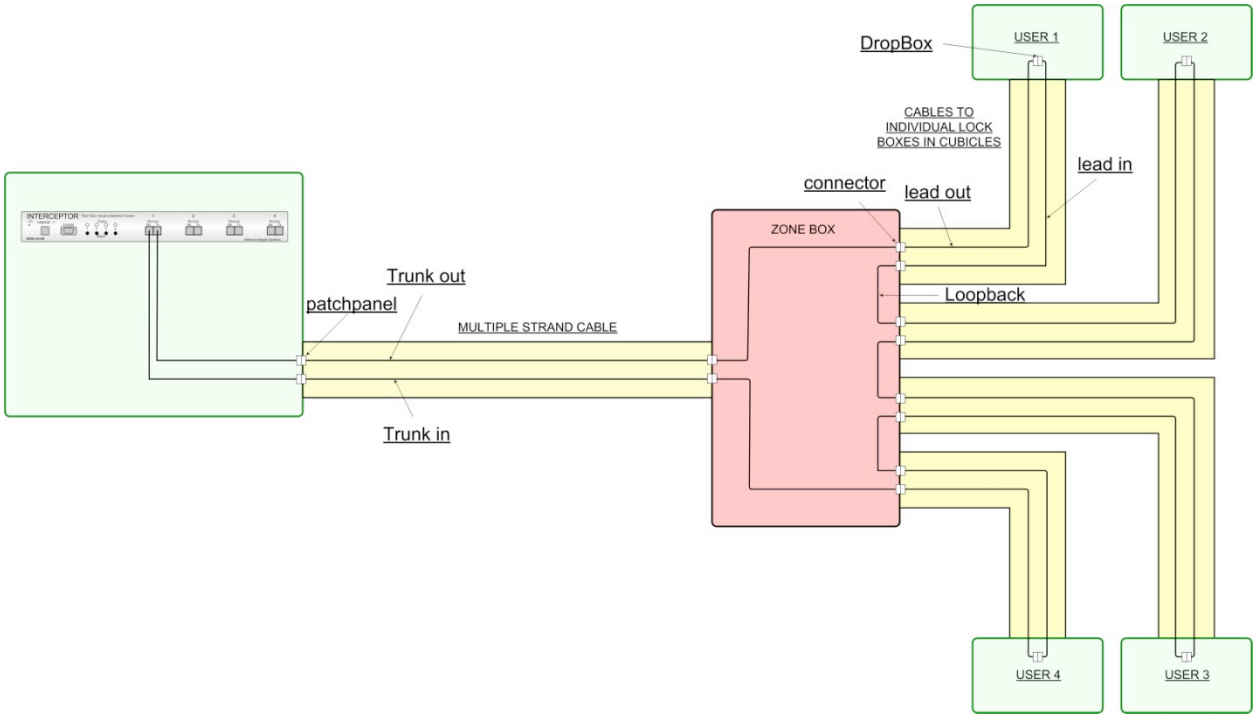
Application Note: Point-to-Multipoint Loss

This worksheet is intended to aid in calculating the maximum number of drops in a point-to-multipoint (aka hub and spoke) fiber architecture. This architecture allows multiple drops to be monitored by a single Interceptor port. The constraints to consider include:

1) Max physical length of the fiber is 2km for multimode (MM), 12km for single mode (SM); this equals 4km for MM and 24km for SM round trip. This includes all monitored fibers in both the trunk and the cables feeding drop boxes. If greater distances are encountered, please contact the factory for guidance.
2) Max total system loss per Interceptor port is 20dB for MM, 25dB for SM
3) Due to the regulations governing alarmed carrier PDS, in the event of an alarm that PDS must be inspected within 15 minutes. Multiple drops or zones on a single Interceptor port should be physically located conducive to efficient and timely inspections.

A representative installation is shown below. Note that 4 user drops are illustrated; this number can be increased as long as the three constraints above are all met.



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1) To calculate total system loss, the following information will be needed:
   a. SM or MM fiber
   b. Number of drops (cables to drop boxes)
   c. Number of connections per zone. Four are illustrated, but depending on the configuration, there may be more or less.
   d. Length of trunk cable
   e. Average length of cables form Zone Box to Drop Boxes
   f. Fiber attenuation at wavelength of interest
      Common values: 2.9dB/km@850MM, 0.6dB/km@1300MM , 0.25dB/km@1550SM
   g. Connector loss at above wavelength
      Common value approximately 0.3dB
   h. Loss due to loopback mechanism
      Common value approximately 0.1dB

2) Calculate fiber loss to drops:
   a. Fiber loss (typically in dB/km) X length of drop cable.
   b. Return path for drop cable and zone box connector
   c. Attenuation at patch panel connection
   d. Attenuation at zone box connection
   e. Loss per connector X number of connectors
   f. Loopback device such as Timbercon Armadillo
      Note: this is shown as 0dB because all loss of this device is caused by the connectors listed separately. If a different, more lossy device is used, the excess loss should be added here.)

3) Calculate trunk fiber loss similarly by adding up:
   a) Fiber loss (typically in dB/km) X length of trunk cable.
      This will be entered twice- once for each direction- shown on diagram as Trunk Out and Trunk In.
   b) Loss per connector X number of connectors

4) Calculate total fiber length of round trips, including trunk and drops.
   a) Calculate as shown in this example of 8 drops of 104 meters each with a 1.1km trunk. Connectors shown as 0.3 dB, loopback loss 0dB, fiber attenuation 0.25dB/km.

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		loss per unit		units		loss	
Total loss from Interceptor to Zone Box:	patchpanel	0.3	dB	1	each	0.30	dB
	Trunk In	0.25	dB/km	1.1	km	0.28	dB
	connectors	0.3	dB	1	each	0.30	dB
	connectors	0.3	dB	1	each	0.30	dB
	Trunk Out	0.25	dB/km	1.1	km	0.28	dB
	patchpanel	0.3	dB	1	each	0.30	dB
					Trunk loss subtotal	**1.75**	**dB**

Loss from Zone Box to each Drop Box:	connectors	0.3	dB	1	each	0.30	dB
	lead out	0.25	dB/km	0.104	km	0.03	dB
	DropBox loop	0.3	dB	1	each	0.30	dB
	lead in	0.25	dB/km	0.104	km	0.03	dB
	conn	0.3	dB	1	each	0.30	dB
	LoopBack	0	dB	1	each	0.00	dB
					Loss per drop	**0.95**	**dB**

	Loss per drop		# of zones		Total	
Total loss from drop boxes	0.95	X	8	=	7.62	dB
				Subtotal to drop boxes	**7.62**	**dB**

	Distance per					
Total trunk distance	1.1	km	2	1-way	2.2	km
Total drop distance	0.104	km	16	1-way	1.664	km
				Total fiber length	**3.86**	**km**

Calculations per example

Total system loss is trunk loss + total zone box.
1.75 + 8.4= 10.15dB
Interceptor limit is 25dB for SM, 20dB for MM

Total fiber length is 3.86km
Interceptor limit is 24km SM, 4km MM (12kmSM, 2kmMM round trips, respectively)

This system is within design constraints.

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Blank worksheet for calculation

		loss per unit		units		loss	
Total loss from Interceptor to Zone Box:	patchpanel		dB		each		dB
	Trunk In		dB/km		km		dB
	connectors		dB		each		dB
	connectors		dB		each		dB
	Trunk Out		dB/km		km		dB
	patchpanel		dB		each		dB
					Trunk loss subtotal		**dB**

Loss from Zone Box to each Drop Box:	connectors		dB		each		dB
	lead out		dB/km		km		dB
	DropBox loop		dB		each		dB
	lead in		dB/km		km		dB
	conn		dB		each		dB
	LoopBack		dB		each		dB
					Loss per drop		**dB**

	Loss per drop		# of zones		Total	
Total loss from drop boxes						dB
				Subtotal to drop boxes		**dB**

	Distance per					
Total trunk distance		km		1-way		km
Total drop distance		km		1-way		km
				Total fiber length		**km**

Total system loss is trunk loss + total zone box.
_____ + _____ =_____dB
Interceptor limit is 25dB for SM, 20dB for MM

Total fiber length is _____km
Interceptor limit is 24km SM, 4km MM linear distance (12kmSM, 2kmMM round trips, respectively)

Is this system within design constraints? _____yes _____no